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SHRP-H-681

Maintenance Work Zone Safety Devices Plans



Strategic Highway Research Program
National Research Council
Washington, DC 1994

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SHRP-H-681
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February 1994

Strategic Highway Research Program
National Academy of Sciences
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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.

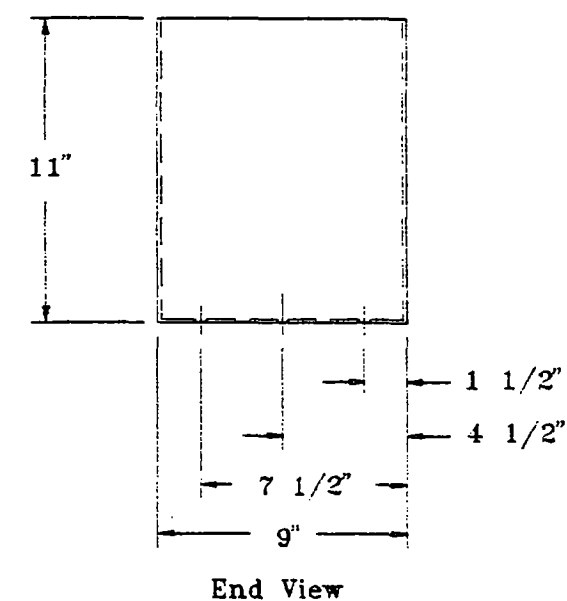
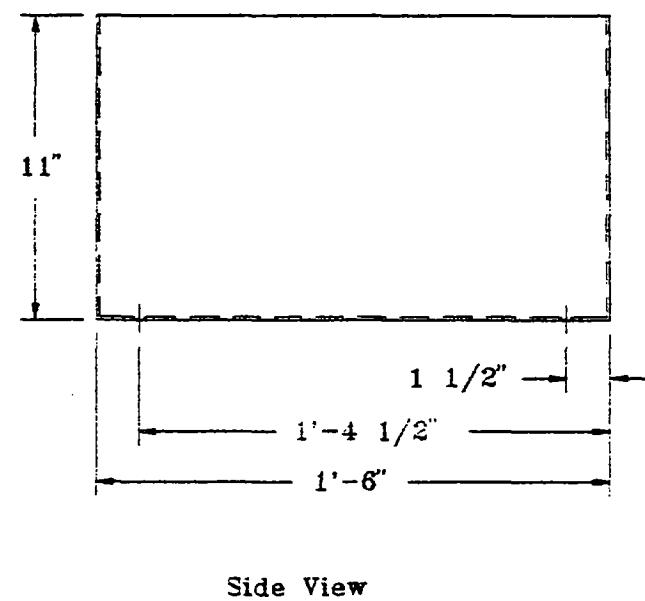
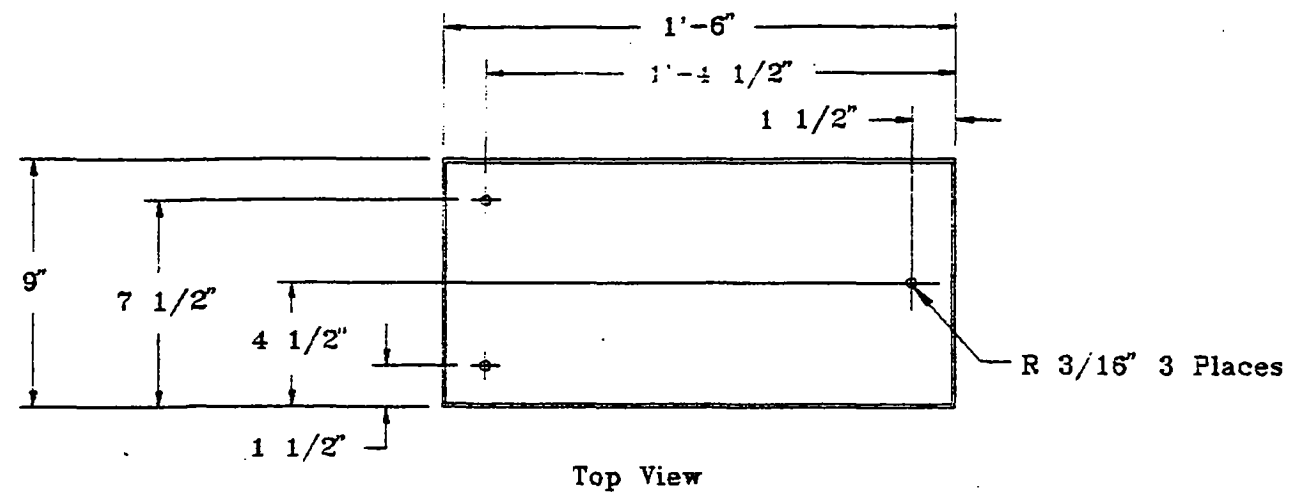
If there are specific questions regarding the plans, the reader should contact the developer of the plans listed on each plan sheet.

Acknowledgments


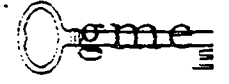
The research described herein was supported by the Strategic Highway Research Program (SHRP). SHRP is a unit of the National Research Council that was authorized by section 128 of the Surface Transportation and Uniform Relocation Assistance Act of 1987.

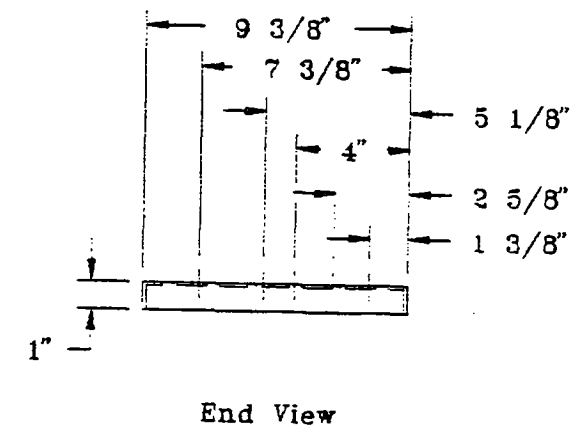
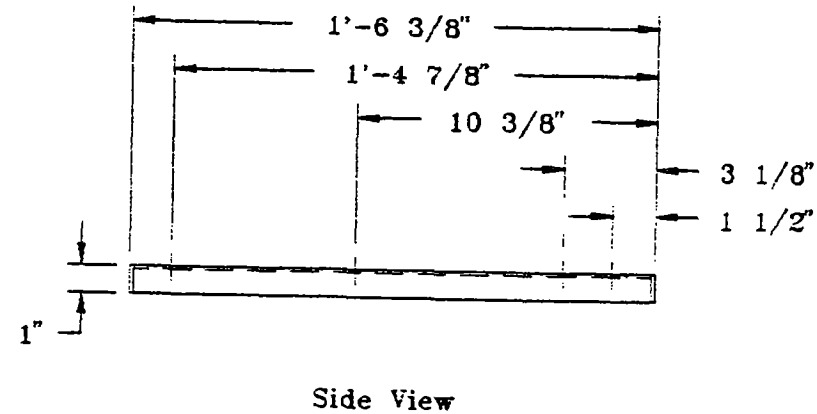
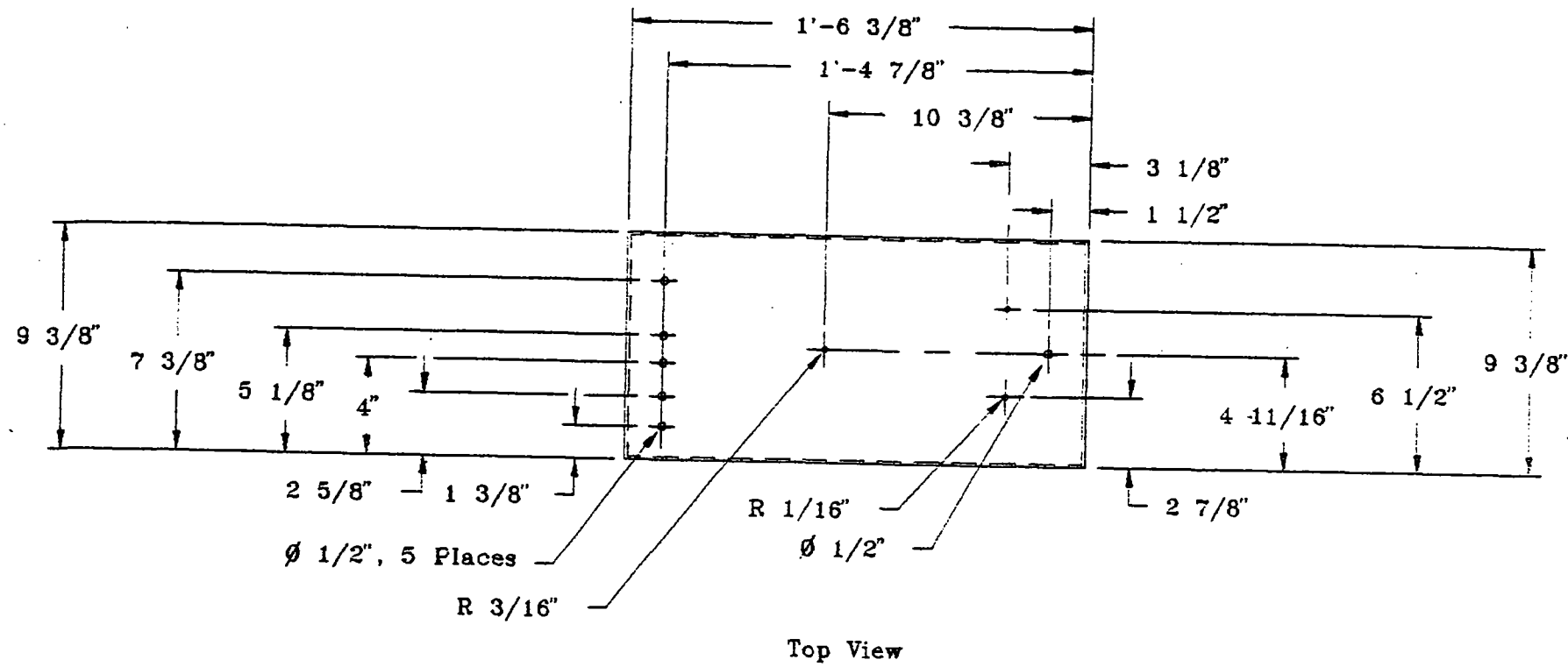
Contents

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	



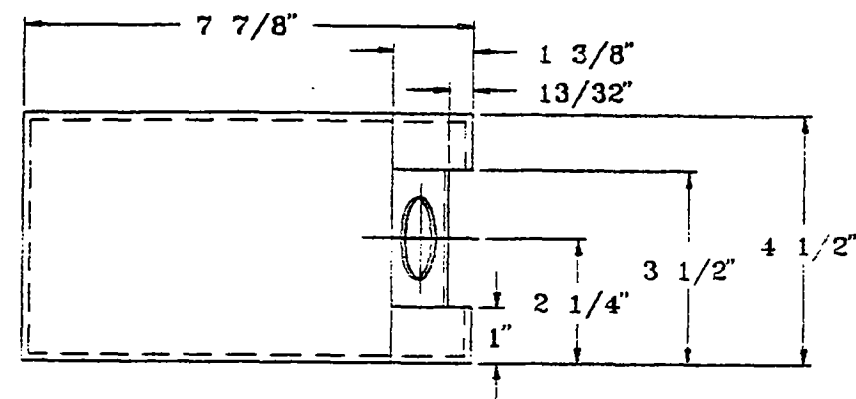
Note: Material of Box is 1/8" Aluminum.

 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc.  (816) 254-1788 P.O. Box 348 Independence, Missouri 64050 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	

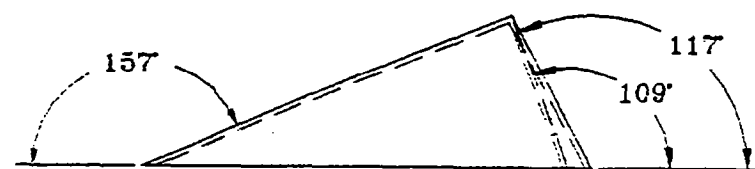


Note: Material of Lid is 1/8" Aluminum.

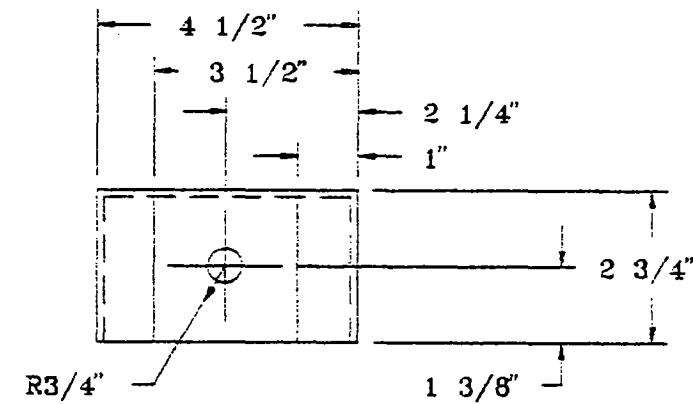
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Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050		(816) 254-1788 FAX (816) 254-4654
TITLE: Ultrasonic Detection Alarm Detector		DRAWN BY: JMM
ASSEMBLY: Lid		REVISED: ---
DRAWING NUMBER: 2 of 16		SCALE: None
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Top View

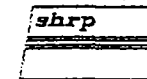


Side View



End View

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

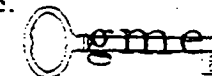


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Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050



(816) 254-1788

FAX (816) 254-4654

TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

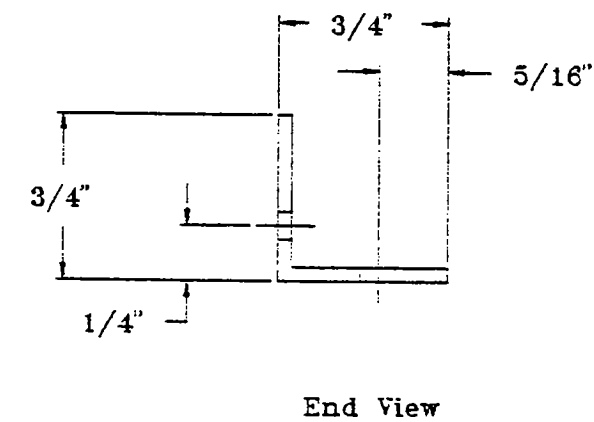
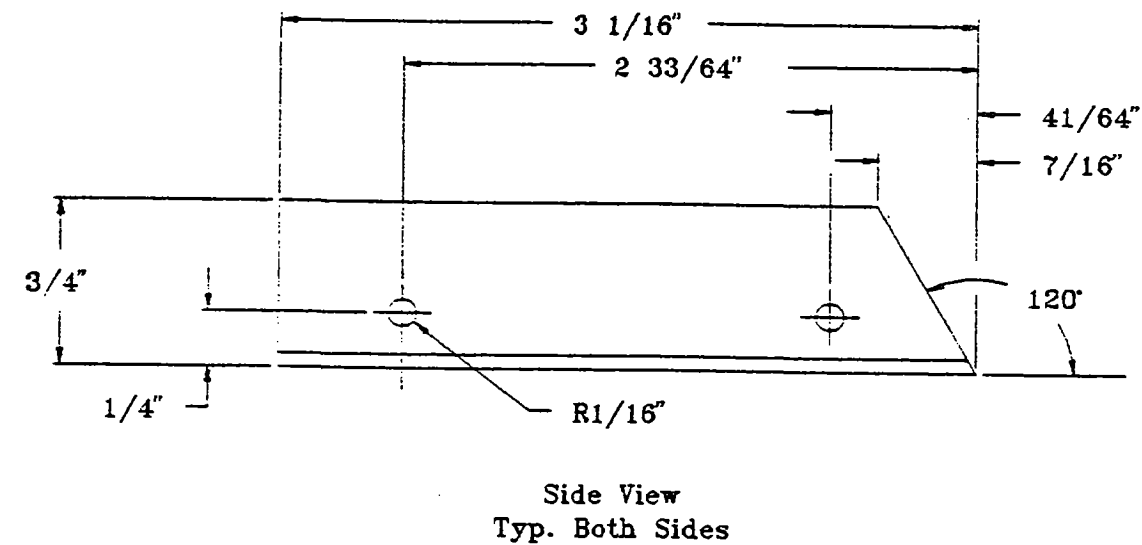
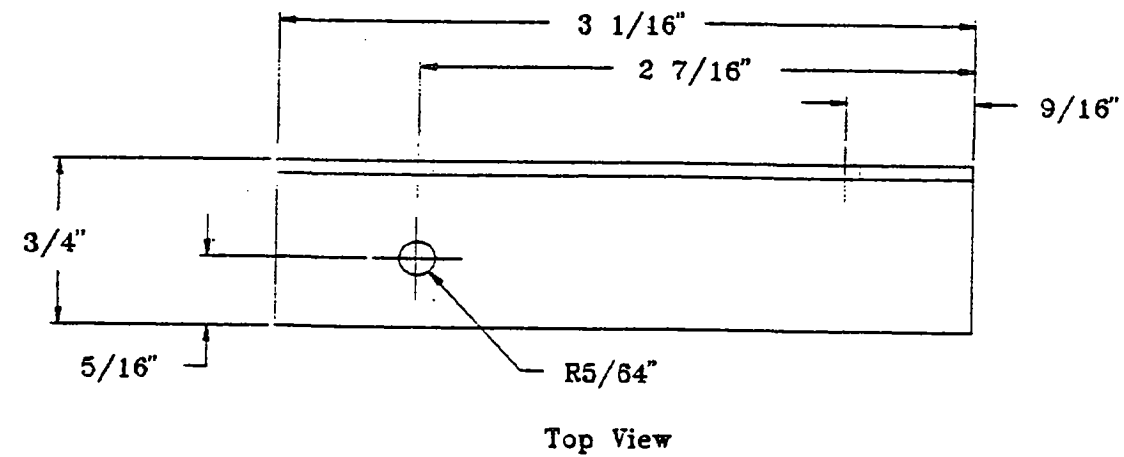
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ASSEMBLY: Hood

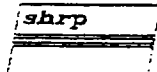
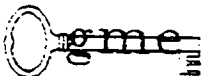
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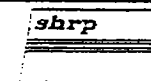
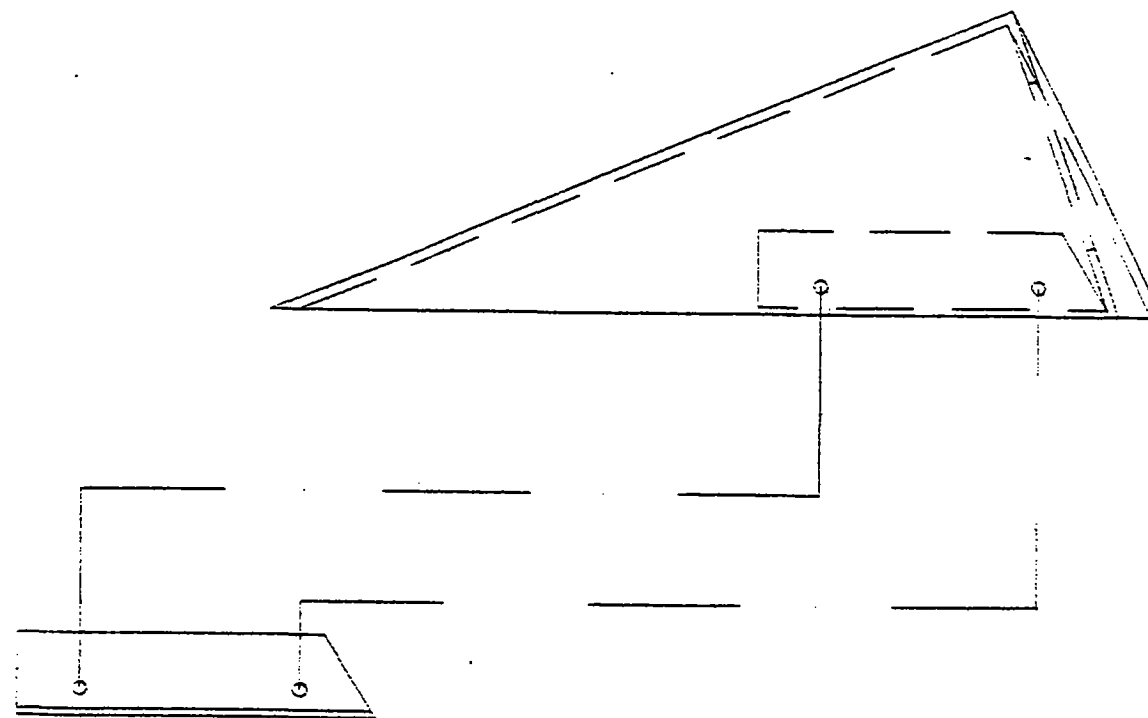
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DATE: 8-27-92



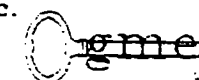
Note: Material of Mount is 3/32" Aluminum.

	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	



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Independence, Missouri 64050



(816) 254-1788
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TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

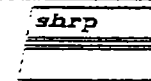
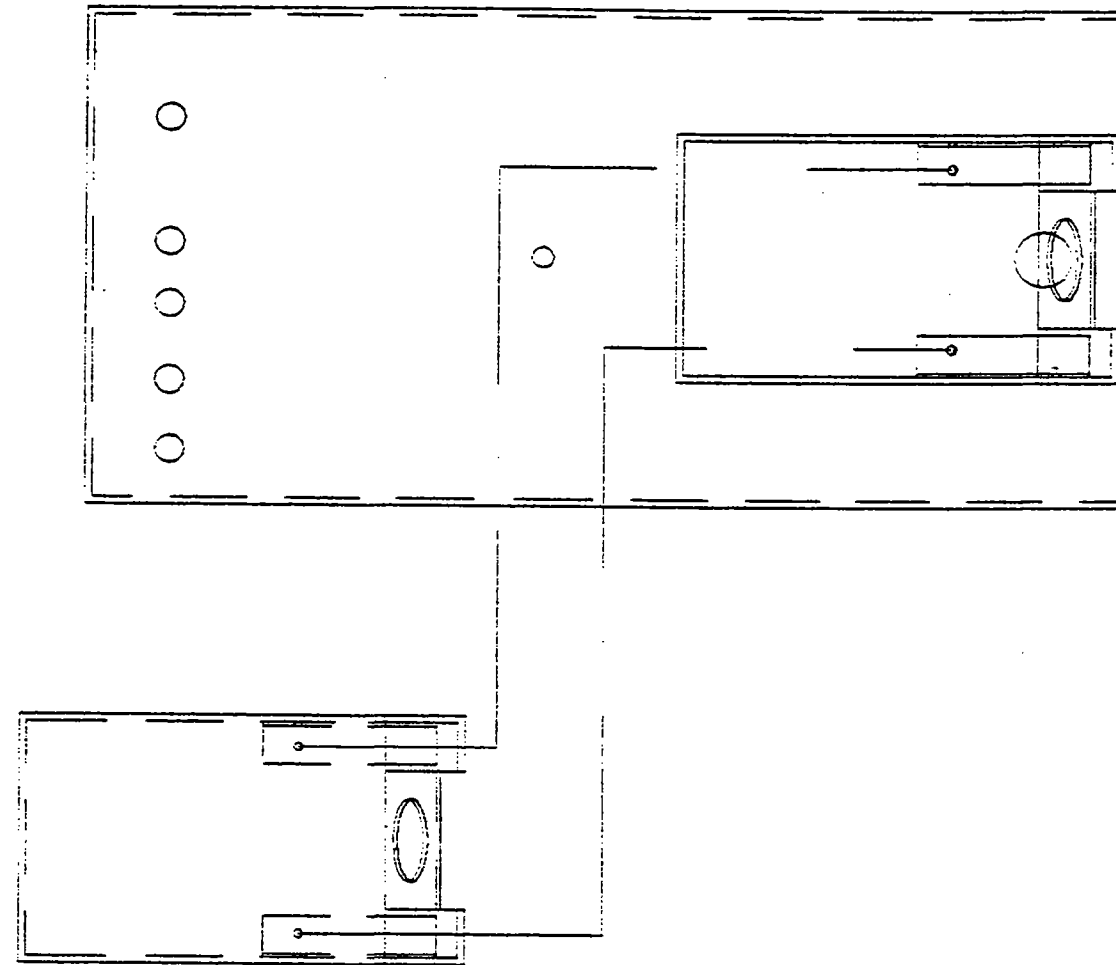
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ASSEMBLY: Mount to Hood

SCALE: None

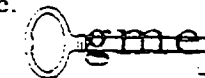
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DATE: 8-27-92



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P.O. Box 348
Independence, Missouri 64050



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

TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

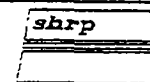
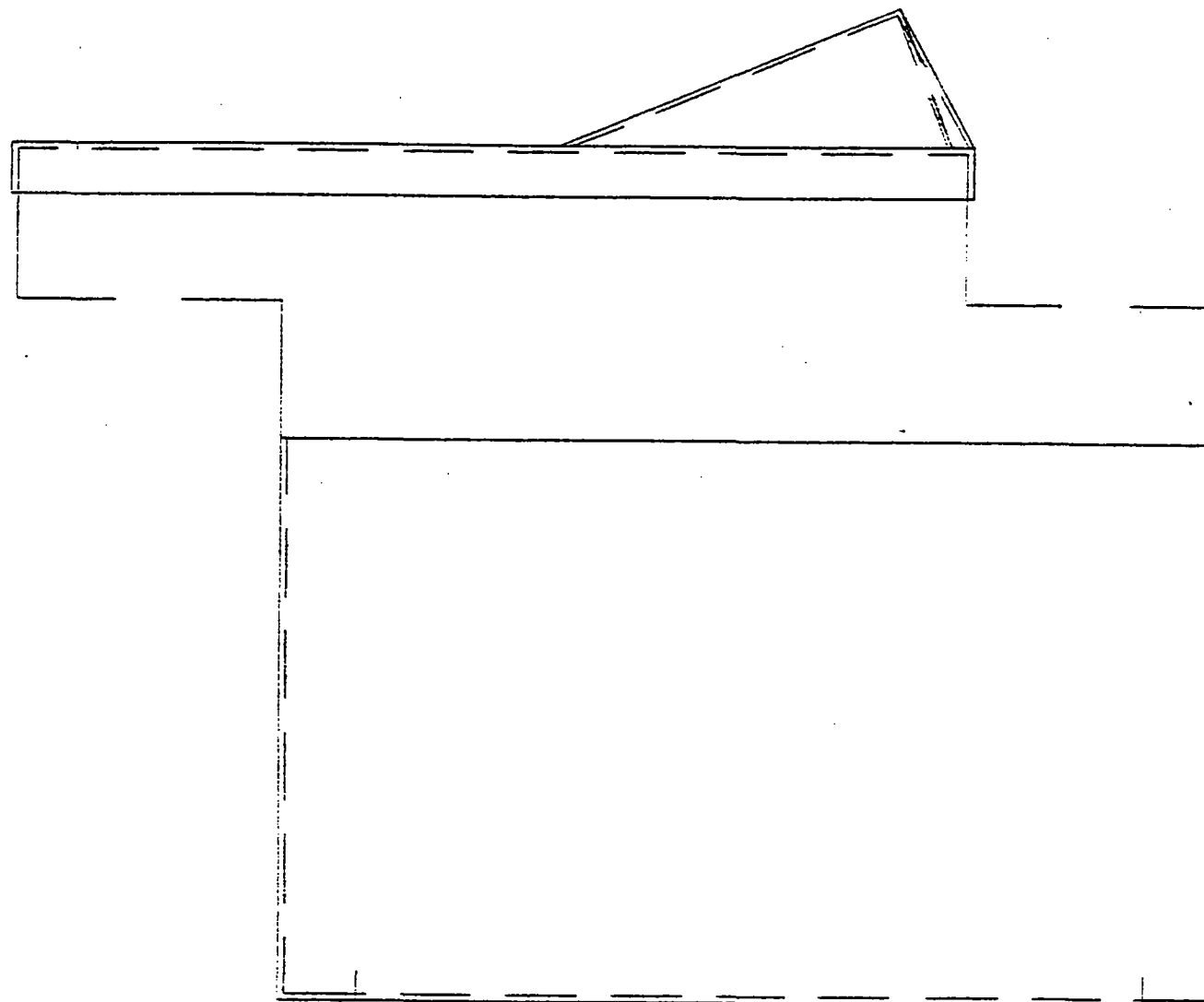
REVISED: ---

ASSEMBLY: Hood to Lid

SCALE: None

DRAWING NUMBER: 6 of 16

DATE: 8-27-92



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Independence, Missouri 64050



(816) 254-1788
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TITLE: Ultrasonic Detection
Alarm

DRAWN BY: JMM

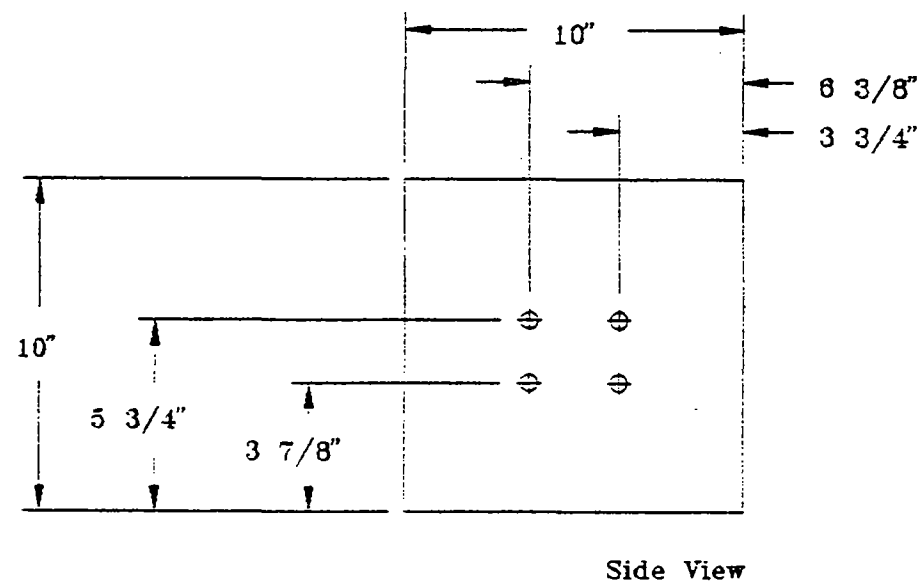
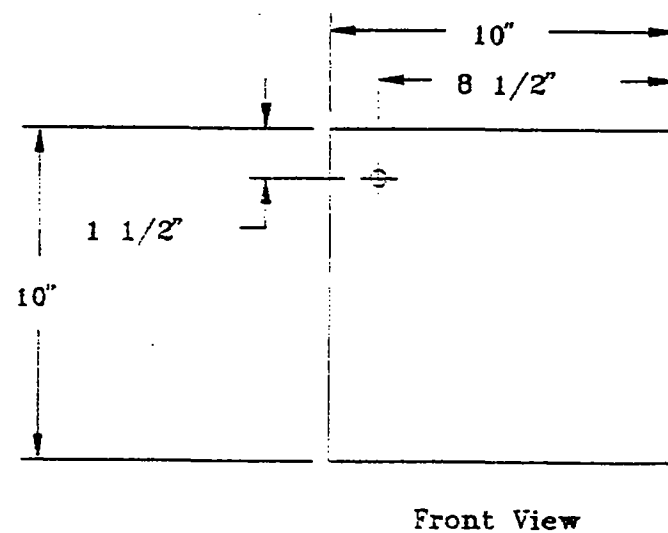
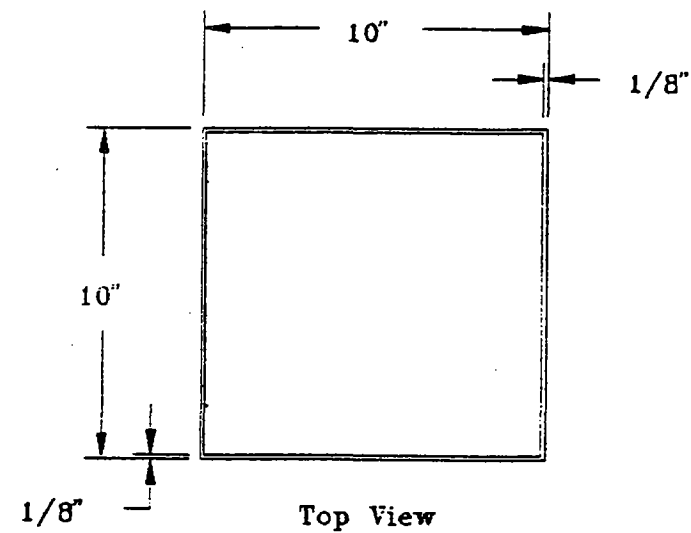
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ASSEMBLY: Lid to Box

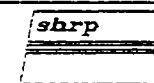
SCALE: None

DRAWING NUMBER: 7 of 16

DATE: 8-27-92



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



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Independence, Missouri 64050



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

TITLE: Ultrasonic Detection
Alarm (Receiver)

DRAWN BY: JMM

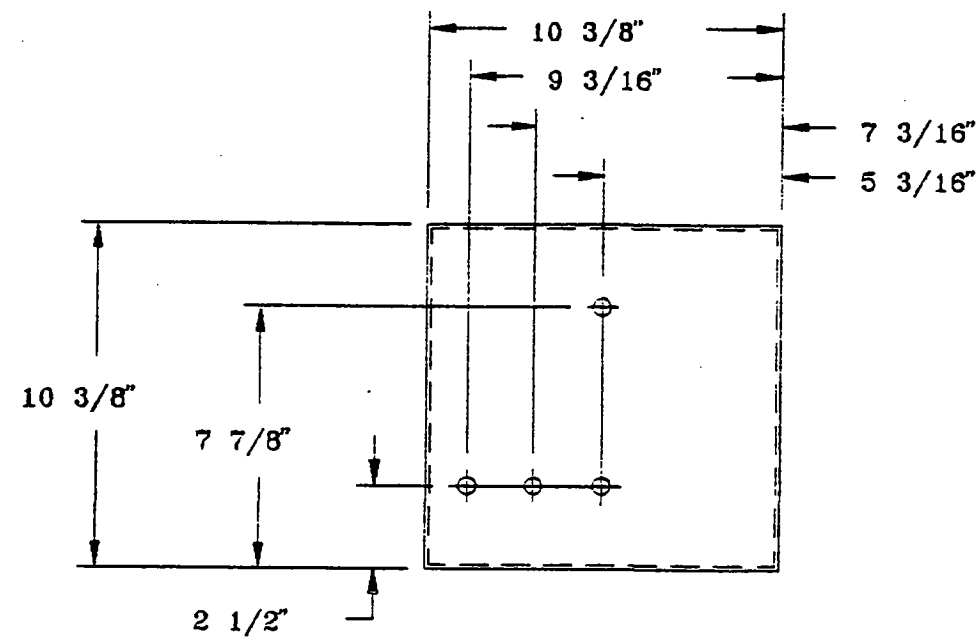
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ASSEMBLY: Box

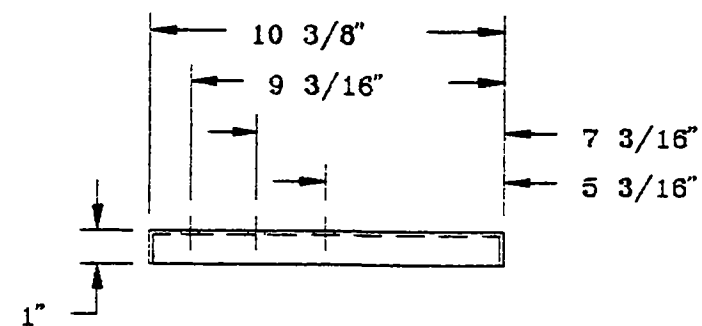
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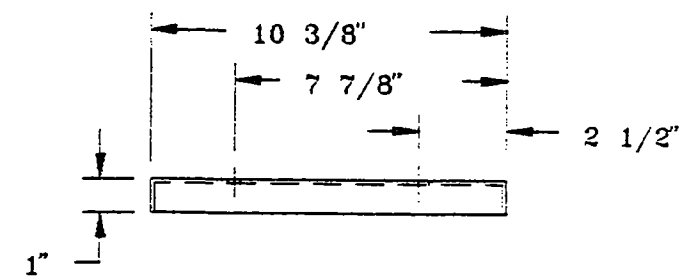
DATE: 07/16/92



Top View

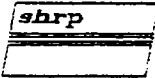
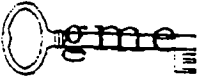


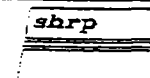
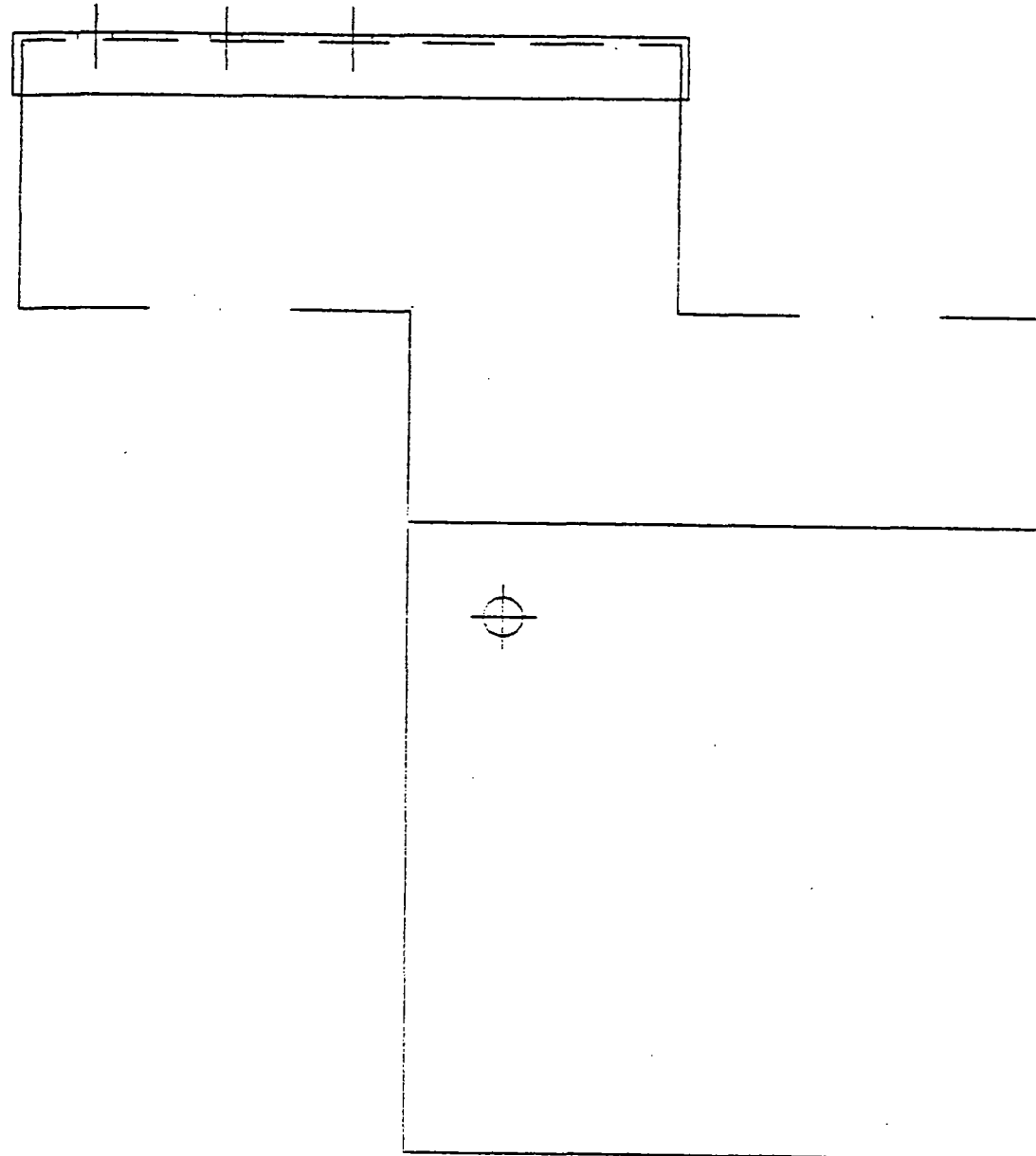
Front View



Side View

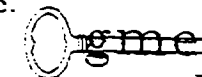
Note: Material of Lid is 1/8" Aluminum.

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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



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Independence, Missouri 64050



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

TITLE: Ultrasonic Detection
Alarm (Receiver)

DRAWN BY: JMM

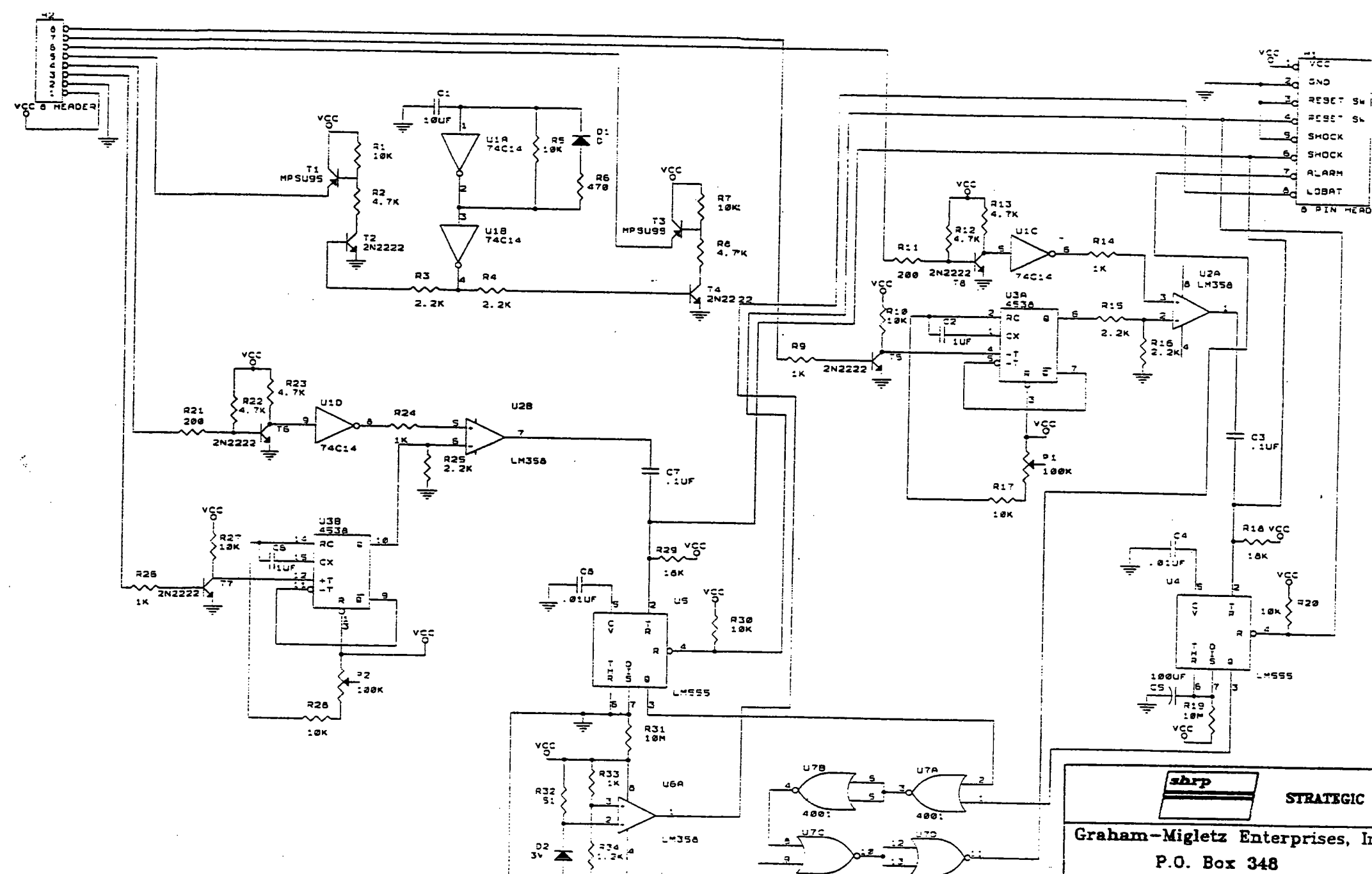
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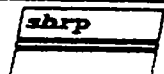
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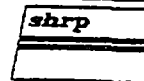
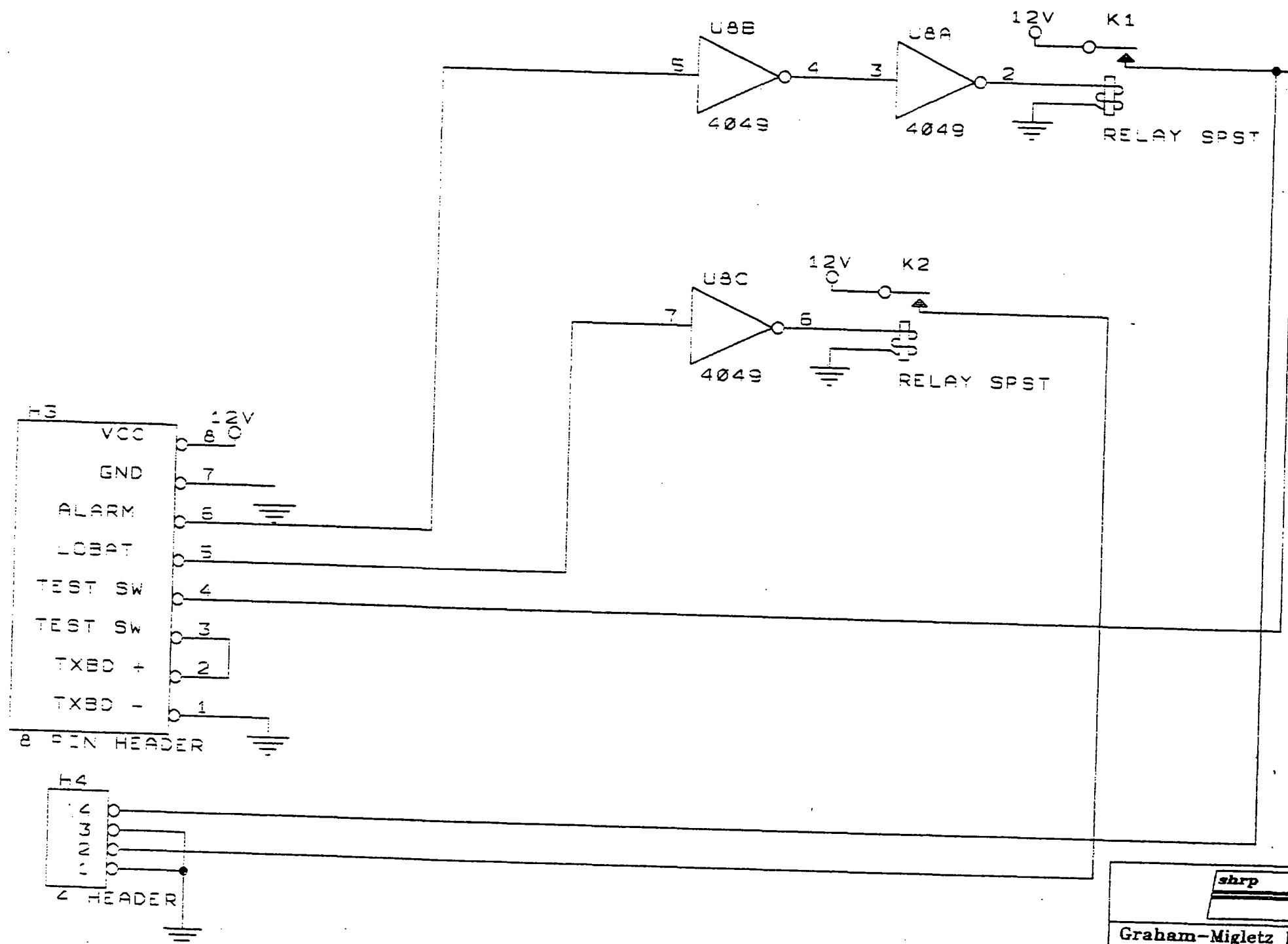
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DRAWING NUMBER: 10 of 16

DATE: 07/20/92



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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
ASSEMBLY: SENSOR BOARD	REVISED: BEF
DRAWING NUMBER: 11 OF 16	SCALE: NONE
DATE: 10-20-92	



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050



(816) 254-1788

FAX (816) 254-4654

TITLE: ULTRASONIC DETECTION ALARM

DRAWN BY: BBF

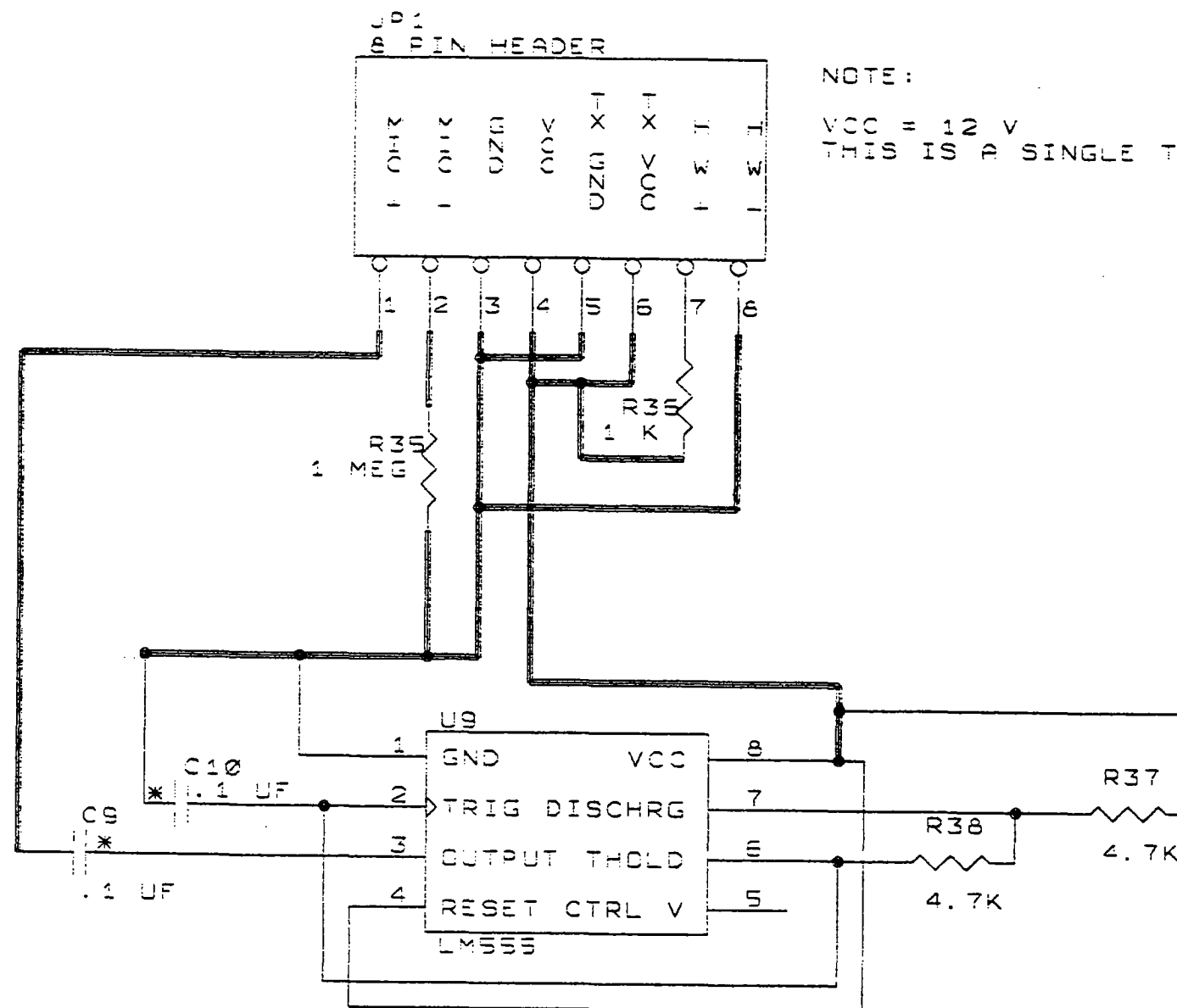
REVISED: BEF

ASSEMBLY: INTERFACE CIRCUIT

SCALE: NONE

DRAWING NUMBER: 12 OF 16

DATE: 10-20-92

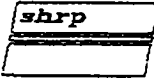
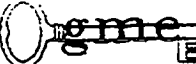


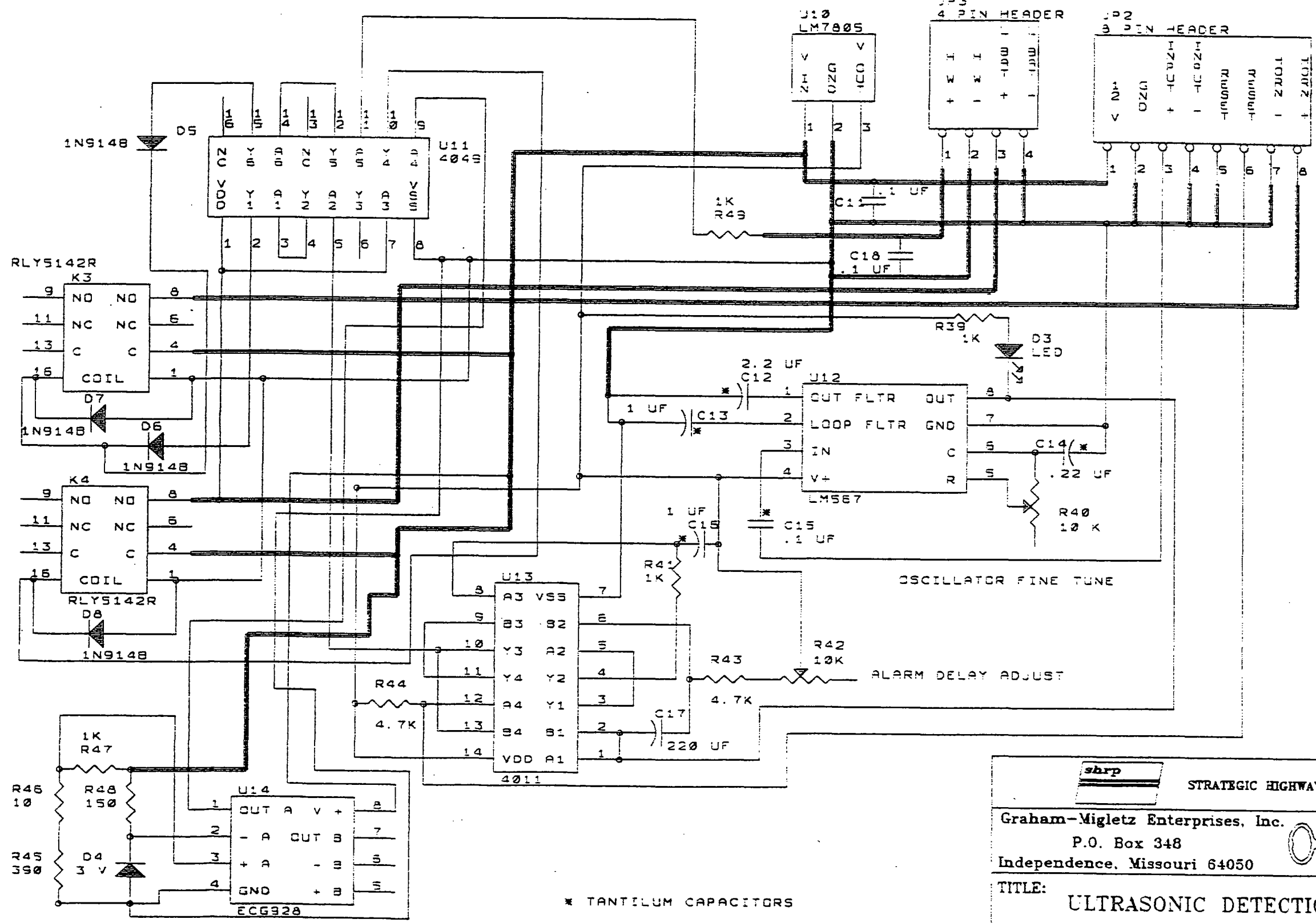
NOTE:

VCC = 12 V

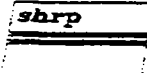
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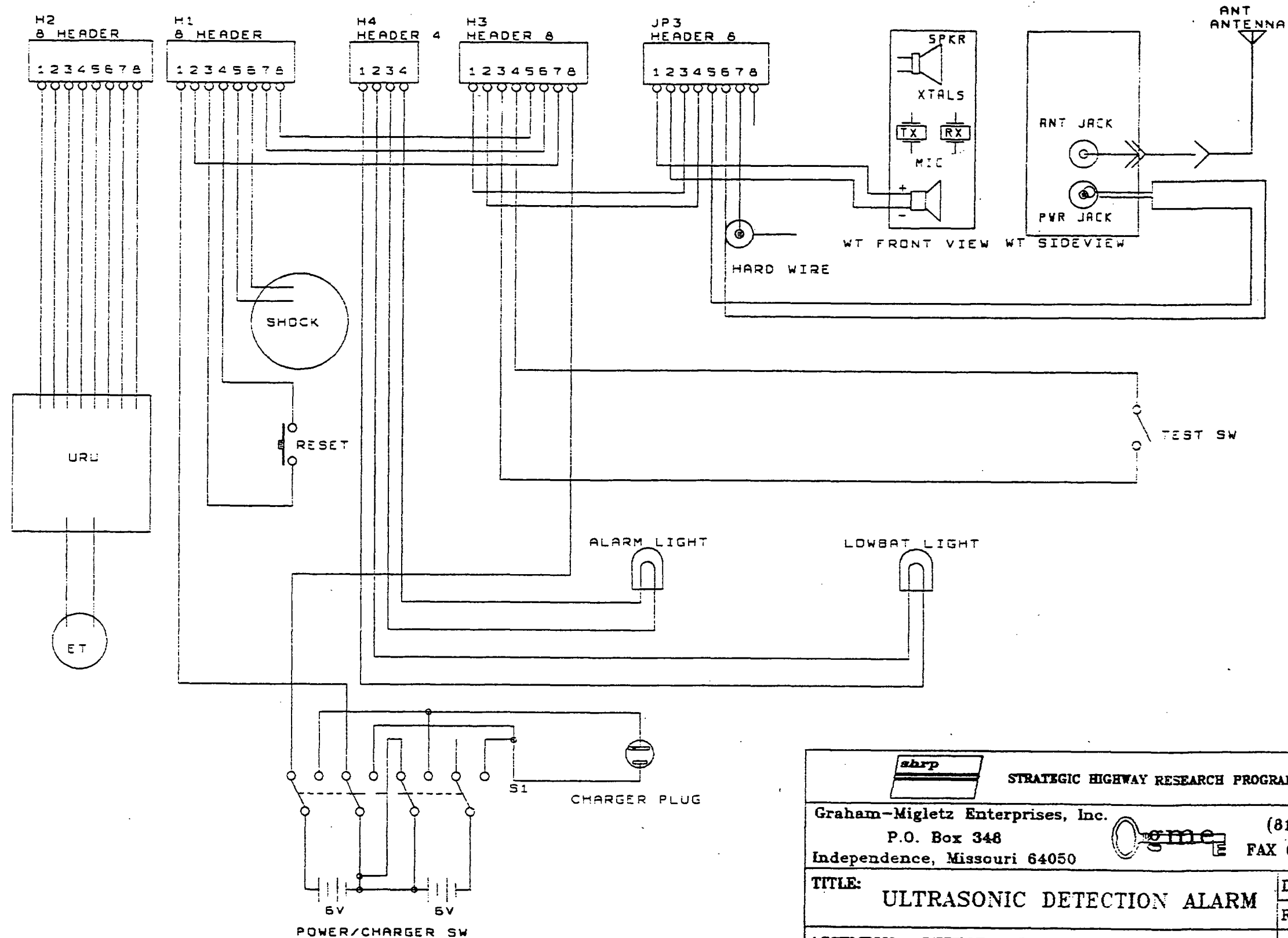
* TANTILUM CAPACITORS

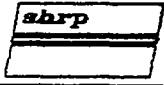
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Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	ULTRASONIC DETECTION ALARM
ASSEMBLY:	TRANSMITTER BOARD
DRAWING NUMBER:	13 OF 16
DRAWN BY:	BBF
REVISED:	BBF
SCALE:	NONE
DATE:	10-20-92

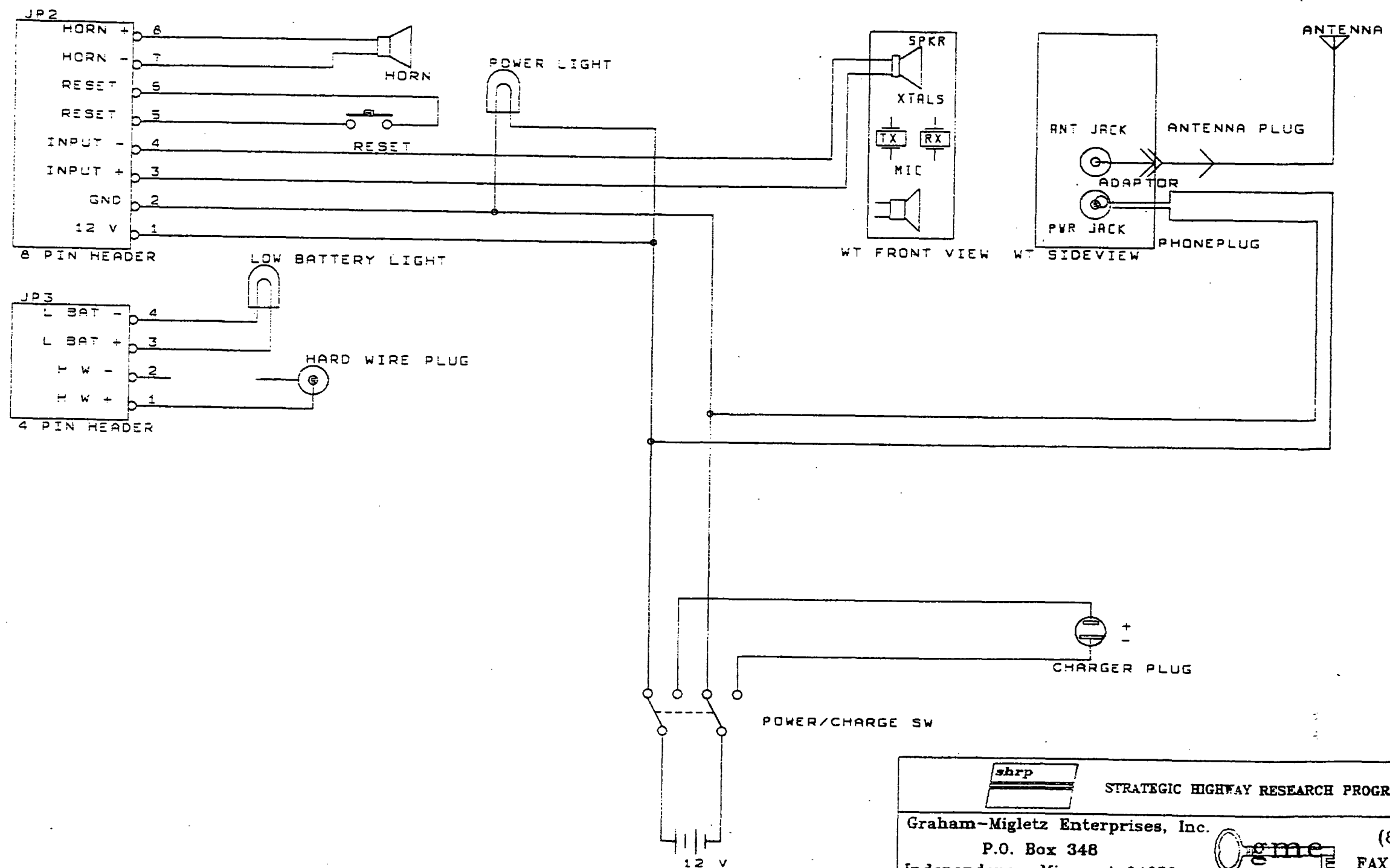


* TANTILUM CAPACITORS

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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



 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
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	REvised: BBF
DRAWING NUMBER: 15 OF 16	SCALE: NONE
DATE: 10-20-92	



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Independence, Missouri 64050



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

TITLE: ULTRASONIC DETECTION ALARM

DRAWN BY: BBF

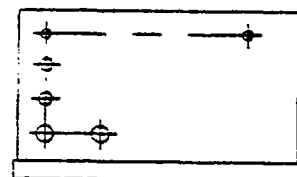
REVISED: BBF

ASSEMBLY: RECEIVER BOX WIRING DIAGRAM

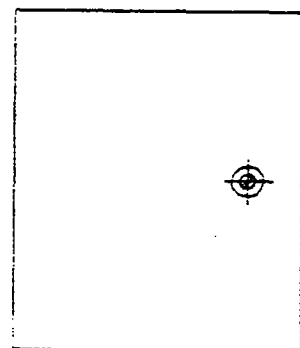
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DRAWING NUMBER: 16 OF 16

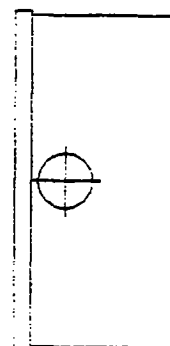
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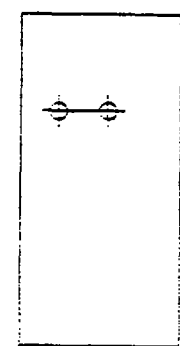
Top View



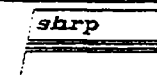
Side View



Front View

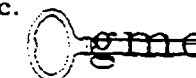


Back View



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

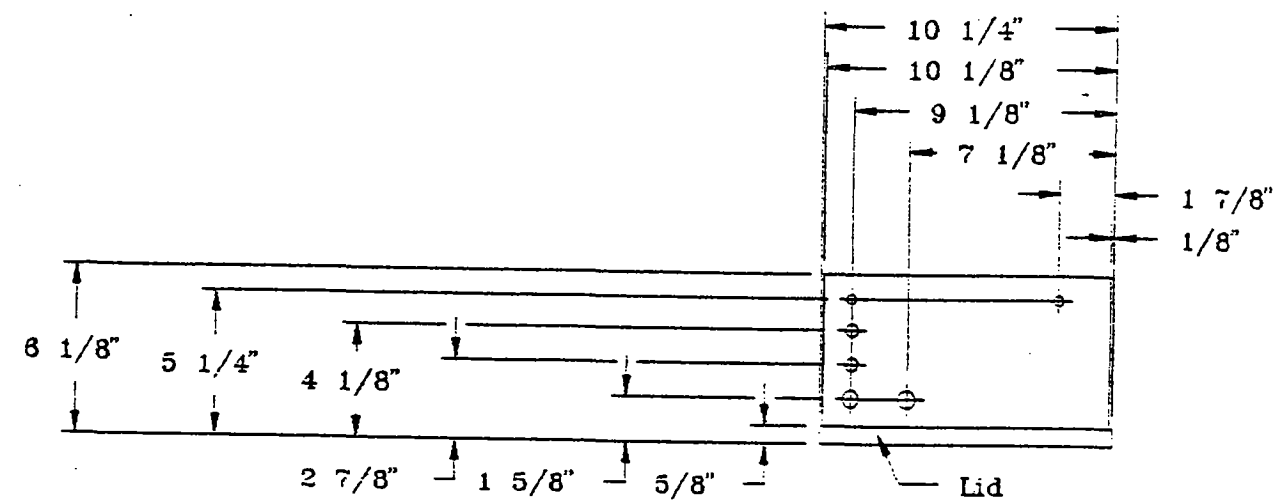
REVISED: ---

ASSEMBLY: N/A


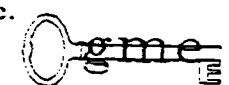
SCALE: None

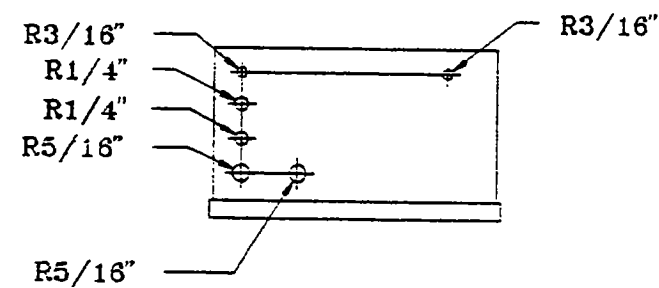
DRAWING NUMBER: 1 of 26

DATE: 8-27-92

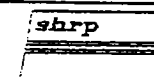


Top View

 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

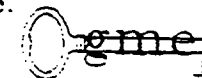


Top View



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

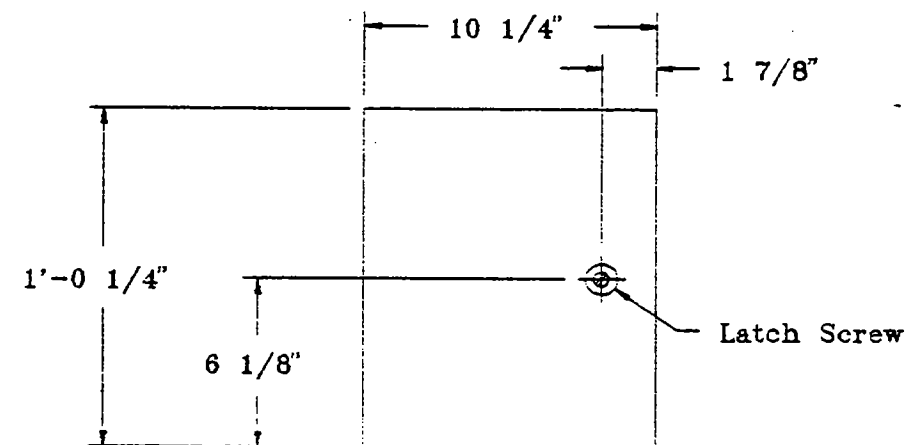
REVISED: ---

ASSEMBLY: N/A

SCALE: None

DRAWING NUMBER: 3 of 26

DATE: 8-27-92

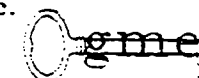


Side View



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

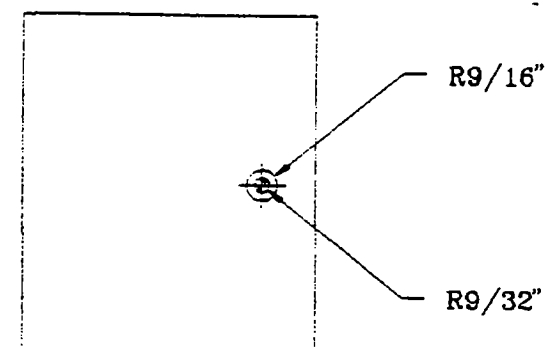
REVISED: ---

ASSEMBLY: N/A

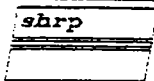
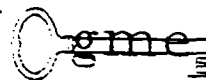
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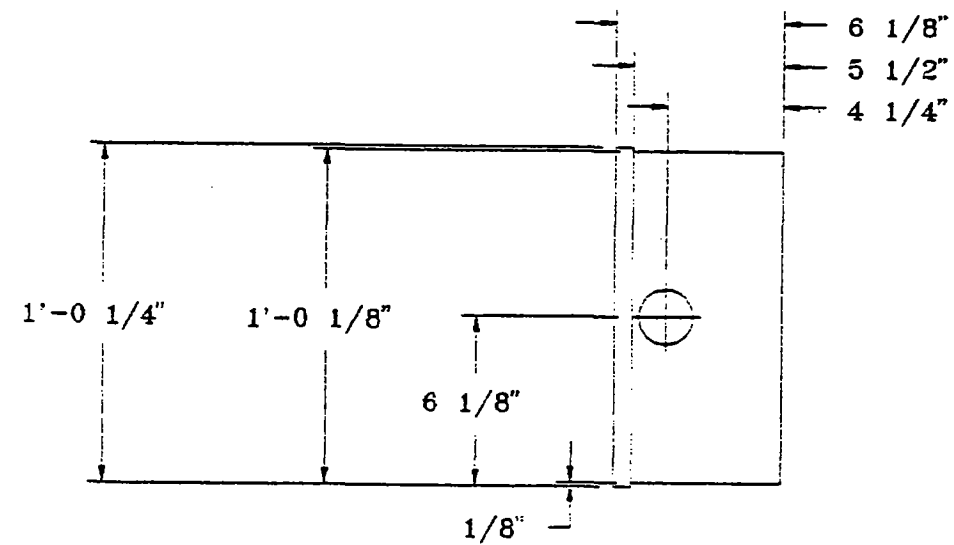
DRAWING NUMBER: 4 of 26

DATE: 8-28-92

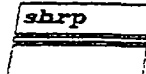
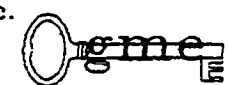


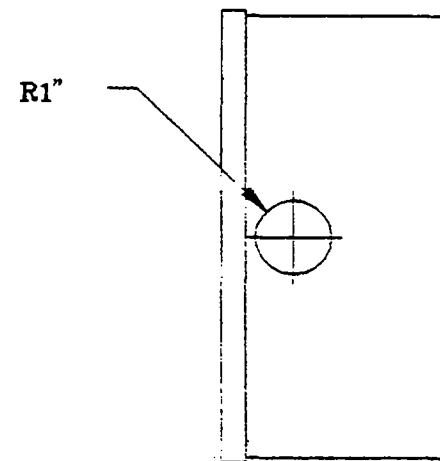
Side View

 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: 5 of 26	
DATE: 8-28-92	

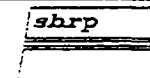


Front View

 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: 6 of 26	DATE: 8-28-92



Front View



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

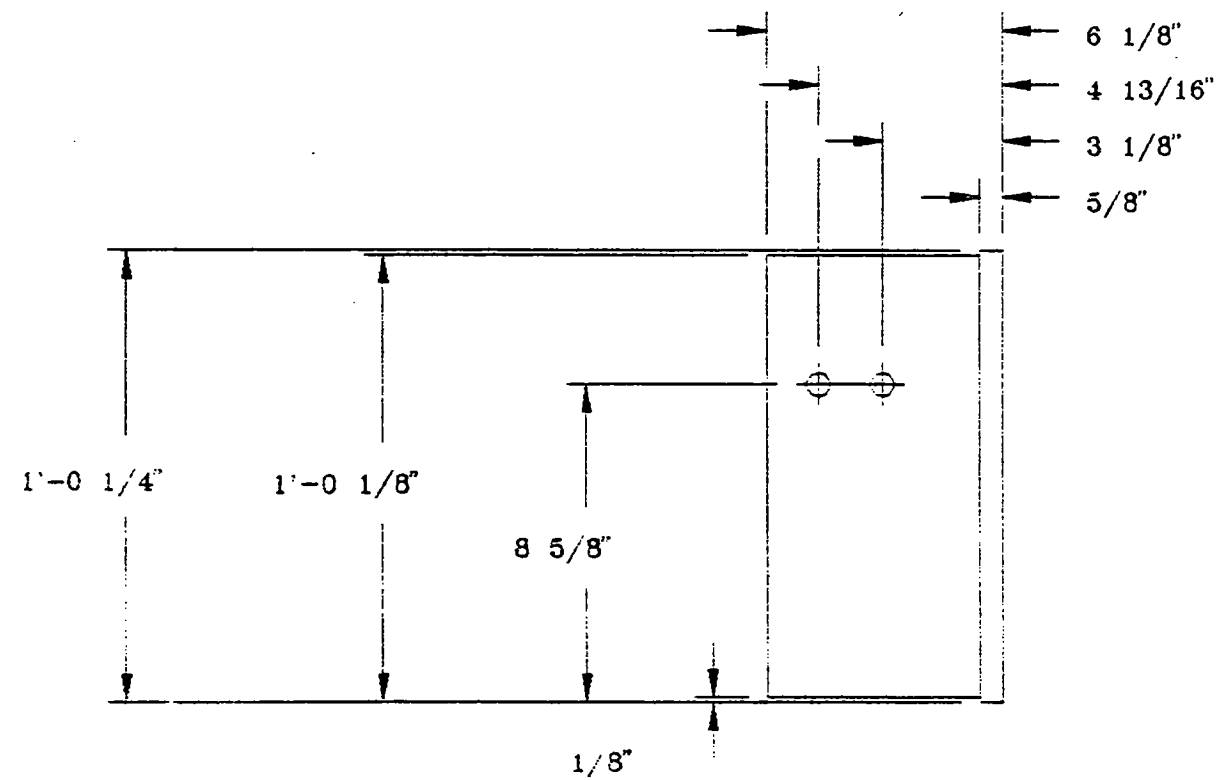
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ASSEMBLY: N/A

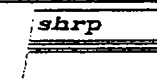
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DRAWING NUMBER: 7 of 26

DATE: 8-29-92

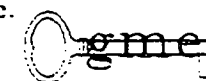


Back View



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

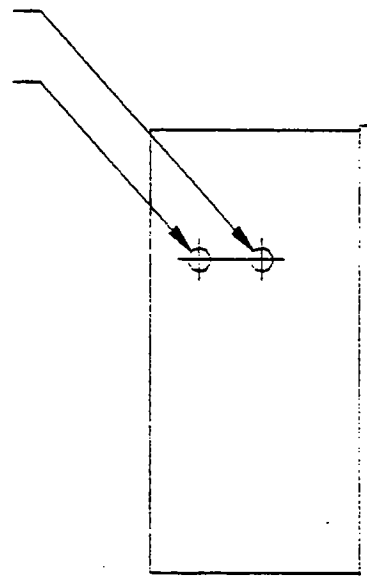
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DRAWING NUMBER: 8 of 26

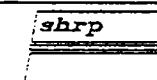
DATE: 8-29-92

R5/16"

R5/16"



Back View



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

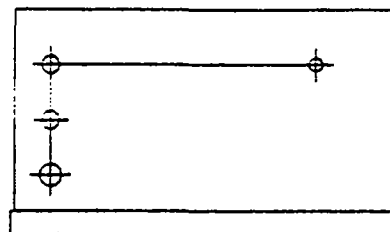
REVISED: ---

ASSEMBLY: N/A

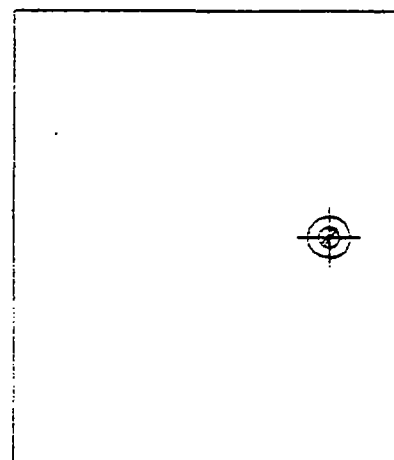
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DRAWING NUMBER: 9 of 26

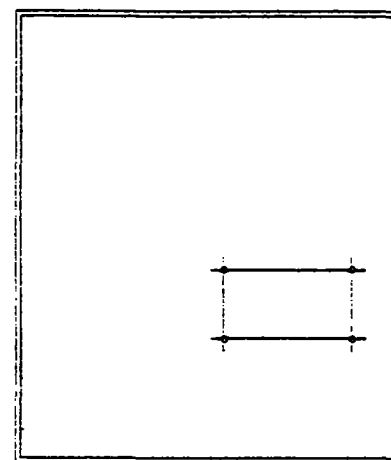
DATE: 8-29-92



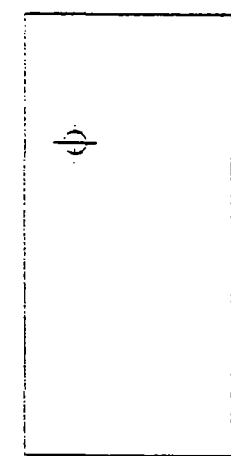
Top View



Right Side View



Left Side View



Back View



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

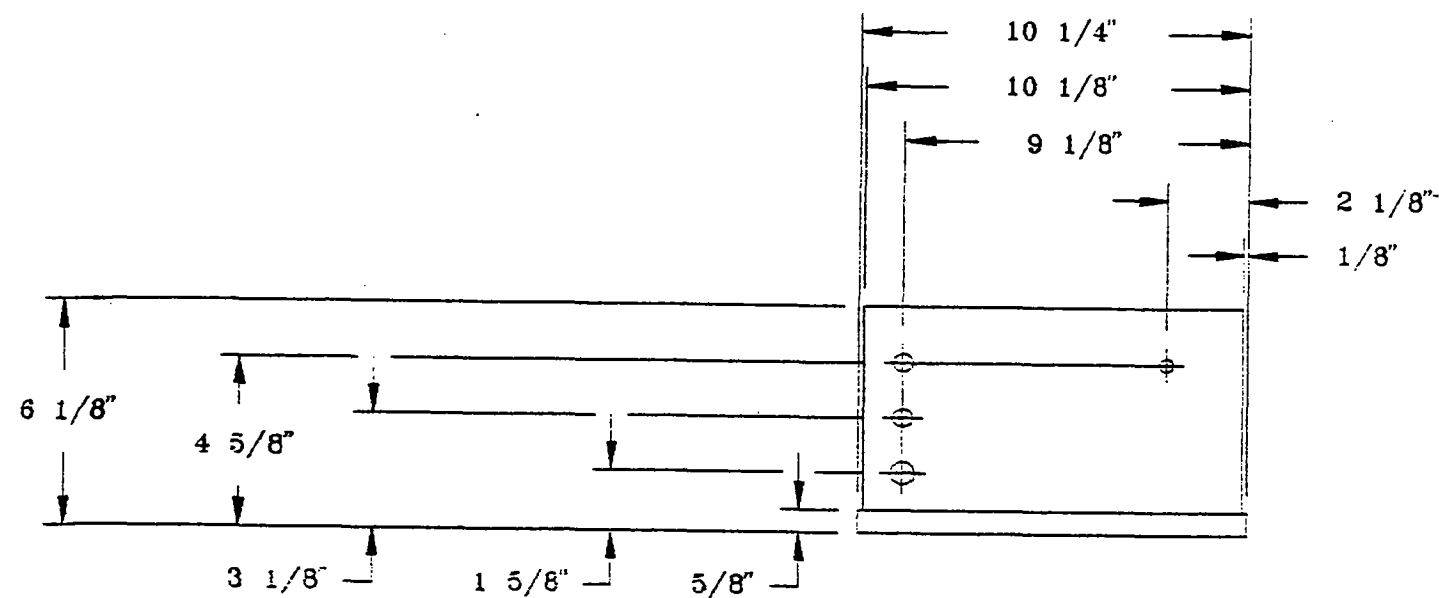
REVISED: ---

ASSEMBLY: N/A


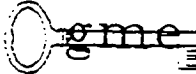
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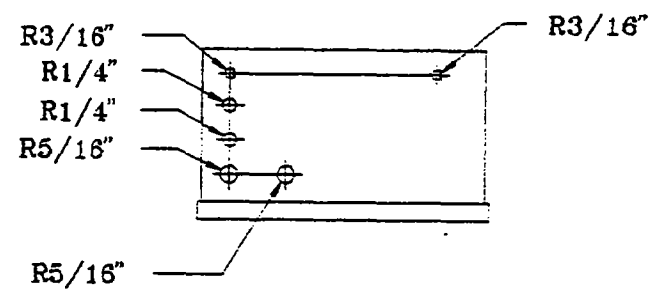
DRAWING NUMBER: 10 of 26

DATE: 8-29-92

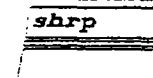


Top View

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



Top View



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

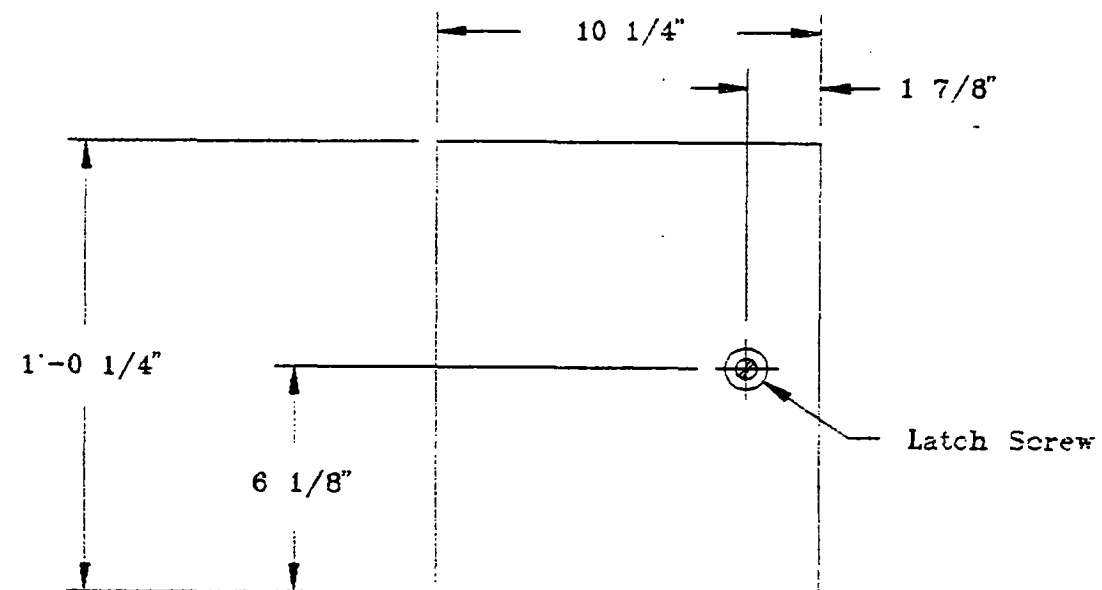
REVISED: ---

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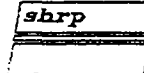
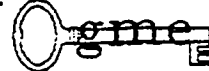
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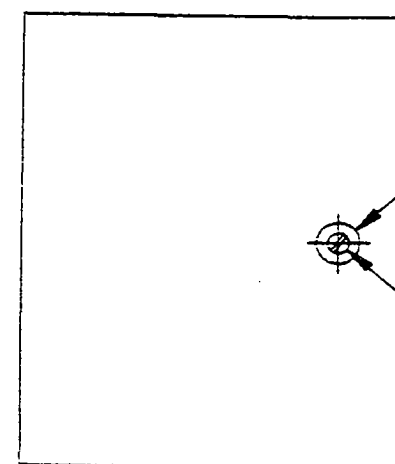
DRAWING NUMBER: 12 of 26

DATE: 8-27-92



Right Side View

 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: 13 of 26	SCALE: None
	DATE: 8-29-92



R9/16"

R9/32"

Right Side View



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

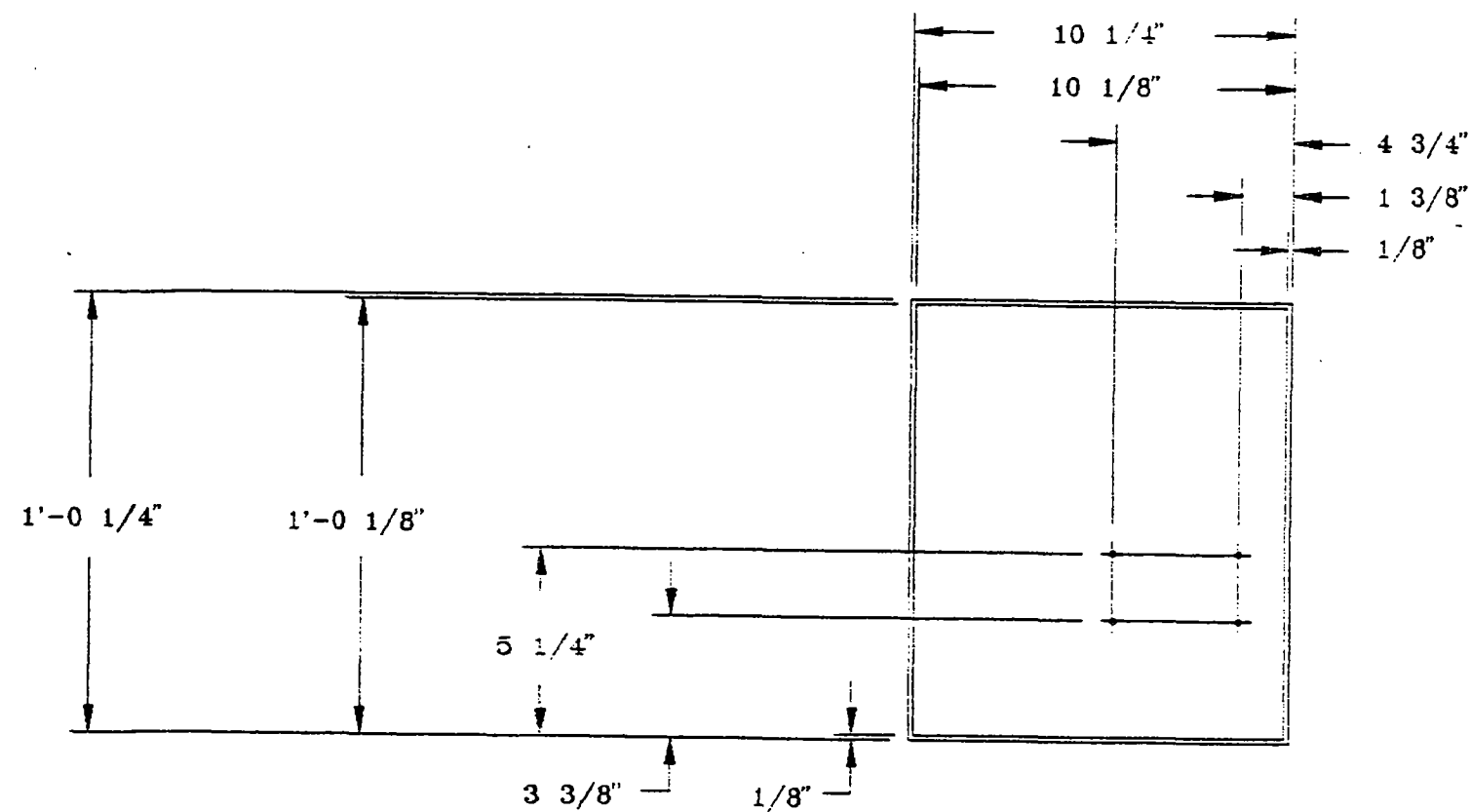
REVISED: ---

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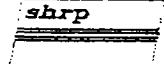
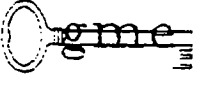
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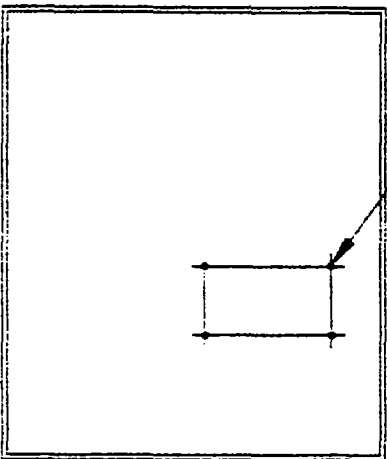
DRAWING NUMBER: 14 of 26

DATE: 8-29-92



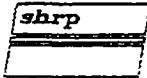

Left Side View

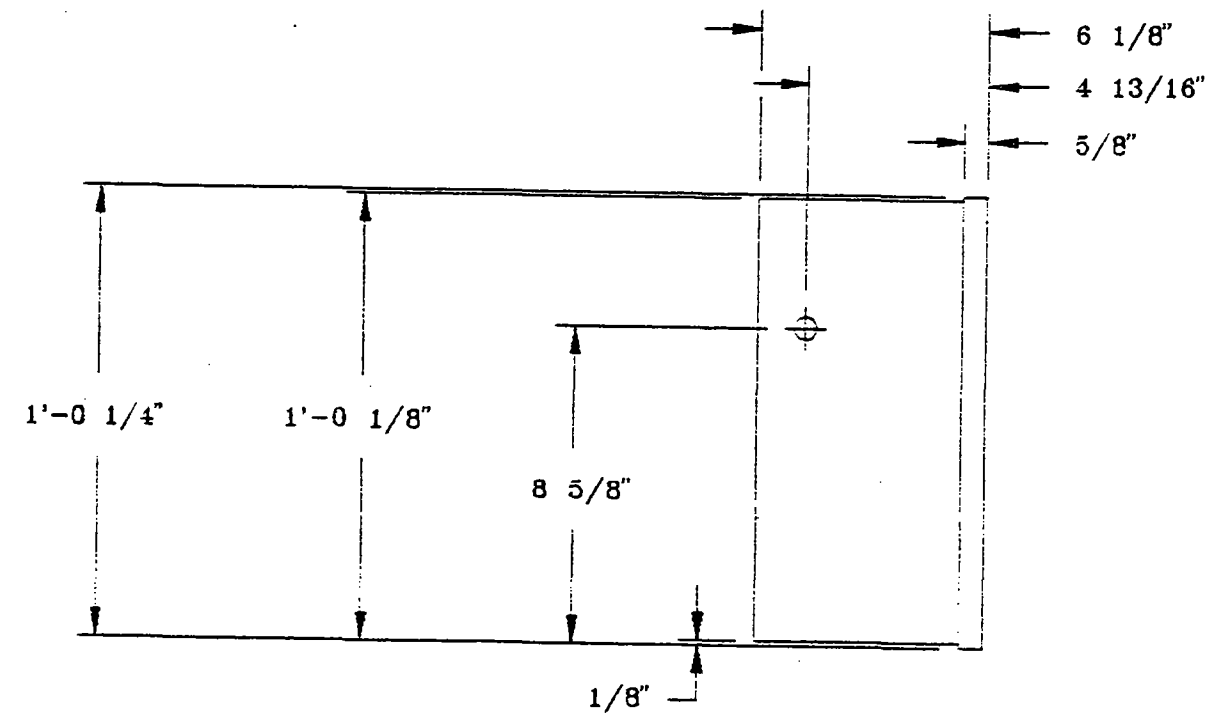
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: Infrared Intrusion Alarm (Receiver)	
DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: N/A	
SCALE: None	
DRAWING NUMBER: 15 of 26	
DATE: 8-29-92	



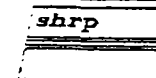
R3/32", Typ. 4 Places.

Left Side 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 (Receiver)		DRAWN BY: JMM	
		REVISED: ---	
ASSEMBLY: N/A		SCALE: None	
DRAWING NUMBER: 16 of 26		DATE: 8-30-92	



Back View



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: ---

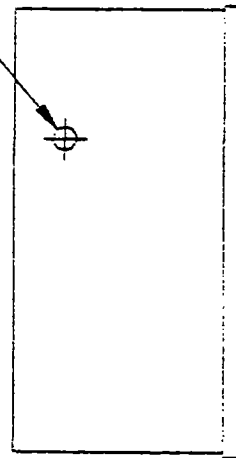
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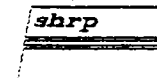
DRAWING NUMBER: 17 of 26

DATE: 8-30-92

R5/16"



Back View

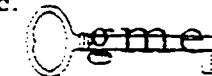


STRATEGIC HIGHWAY RESEARCH PROGRAM

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

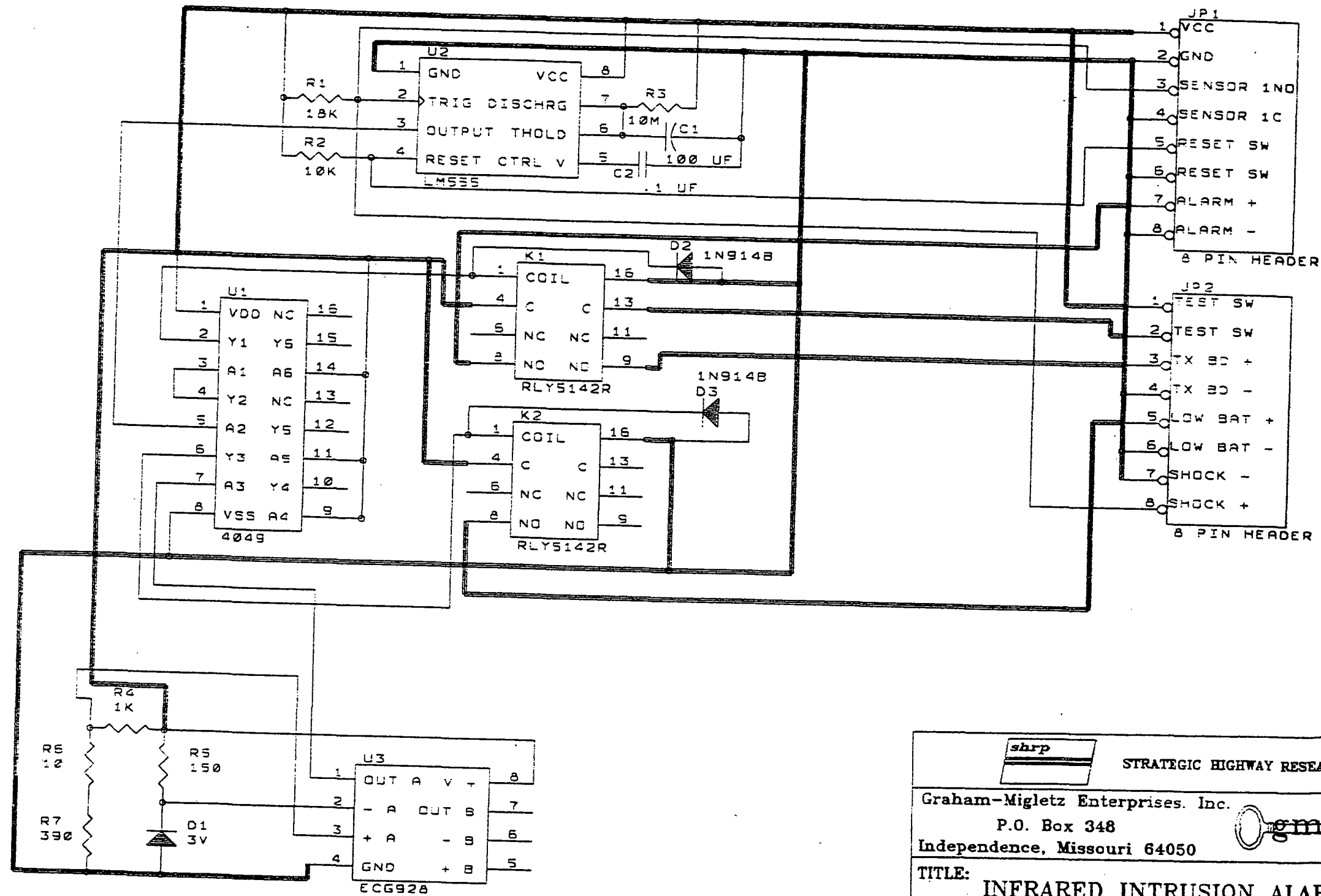
REVISED: ---

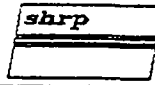
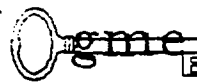
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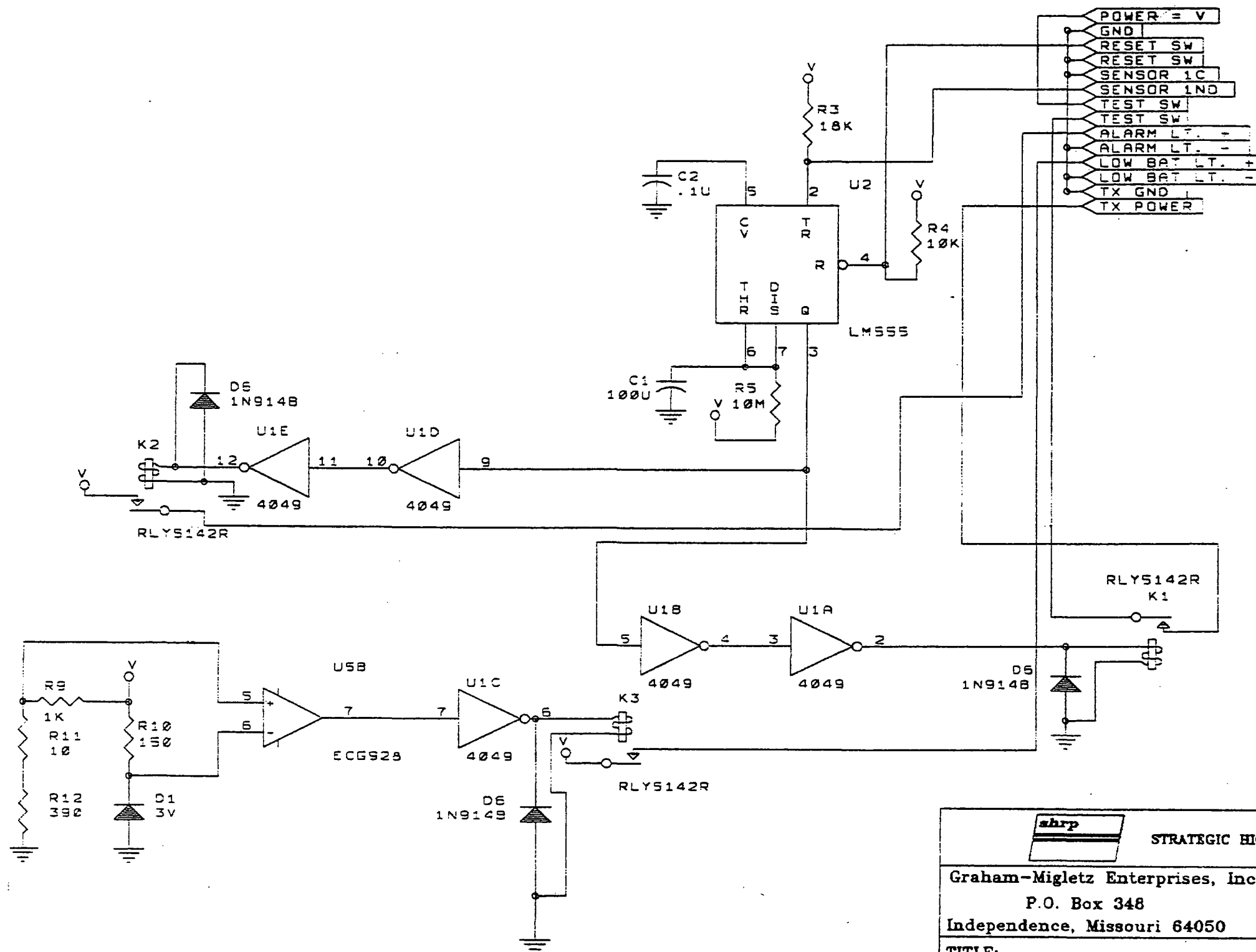
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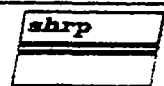
DRAWING NUMBER: 18 of 26

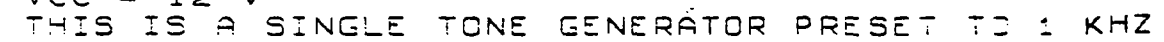
DATE: 8-30-92



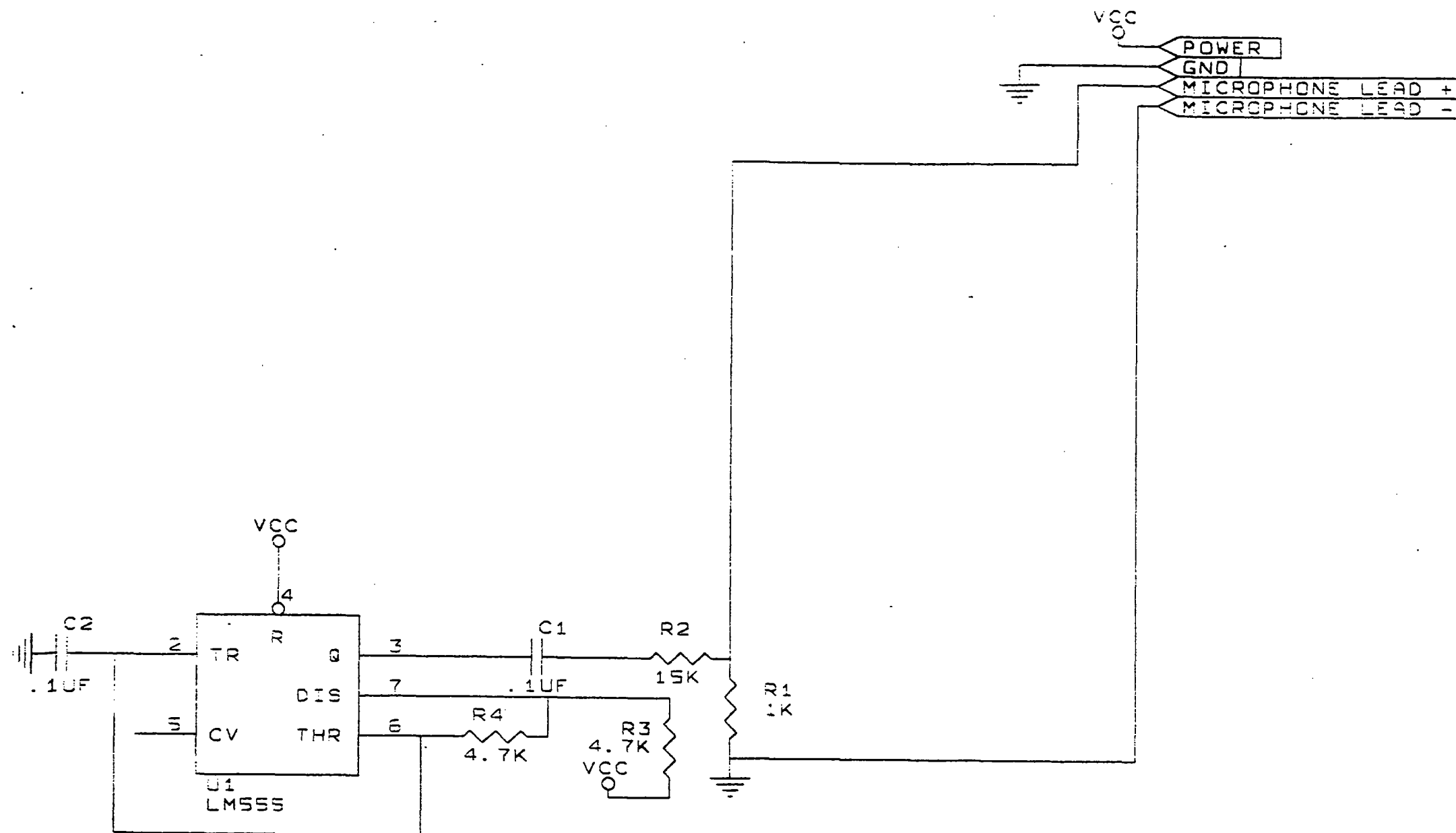
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: INFRARED INTRUSION ALARM	DRAWN BY: BBF
ASSEMBLY: SENSOR BOARD STYLE/LAYOUT	REvised: BBF
DRAWING NUMBER: 19 OF 26	SCALE: NONE
	DATE: 10-20-92



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

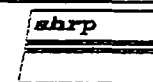


DATE: 10-20-92



NOTES:

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



STRATEGIC HIGHWAY RESEARCH PROGRAM

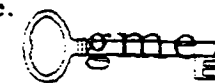
Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654



TITLE: INFRARED INTRUSION ALARM

DRAWN BY: BBF

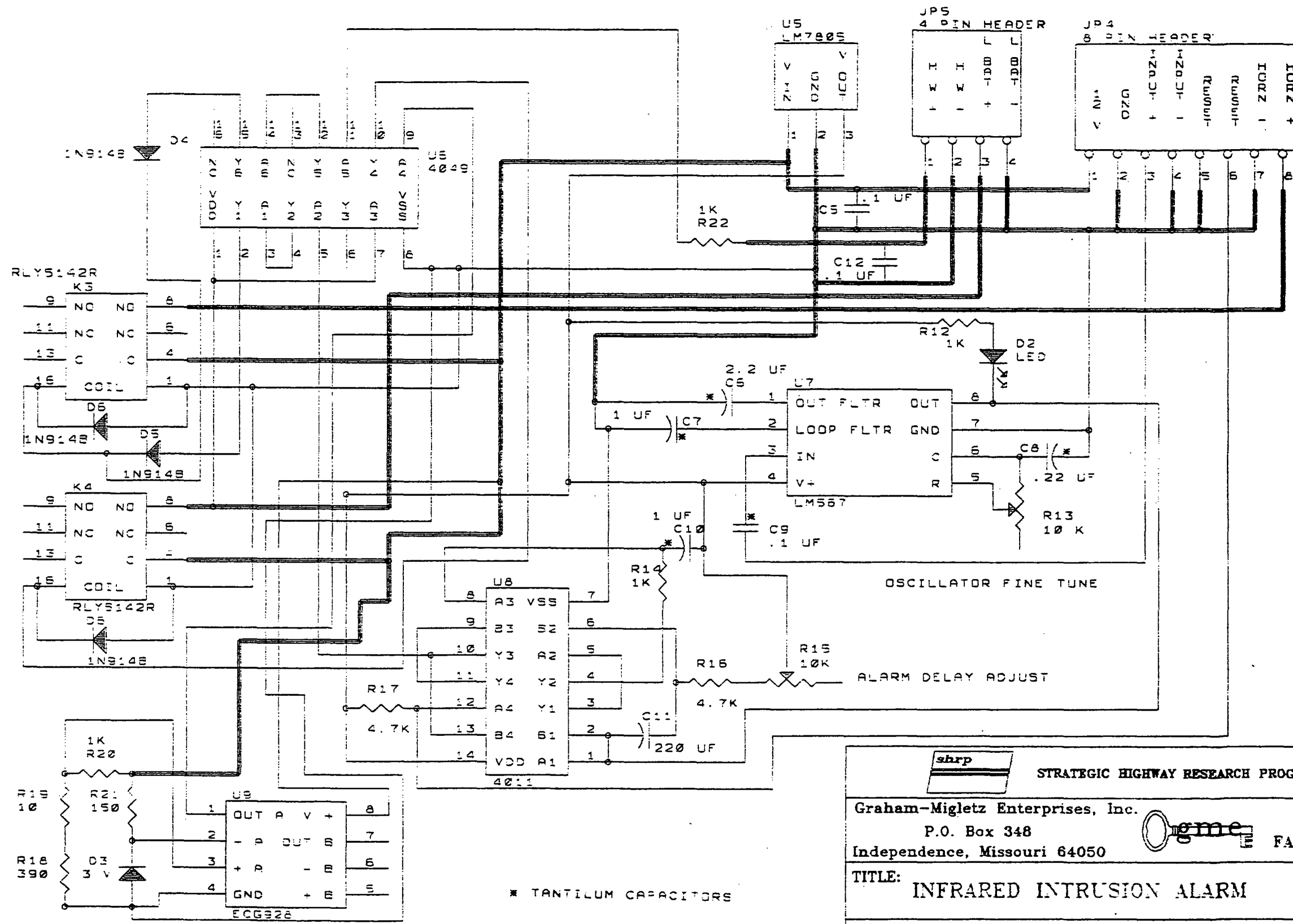
REVISED: BBF

ASSEMBLY: TRANSMITTER BOARD STYLE/SYMBOLIC

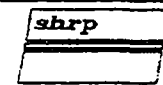
SCALE: NONE

DRAWING NUMBER: 22 OF 26

DATE: 10-20-92

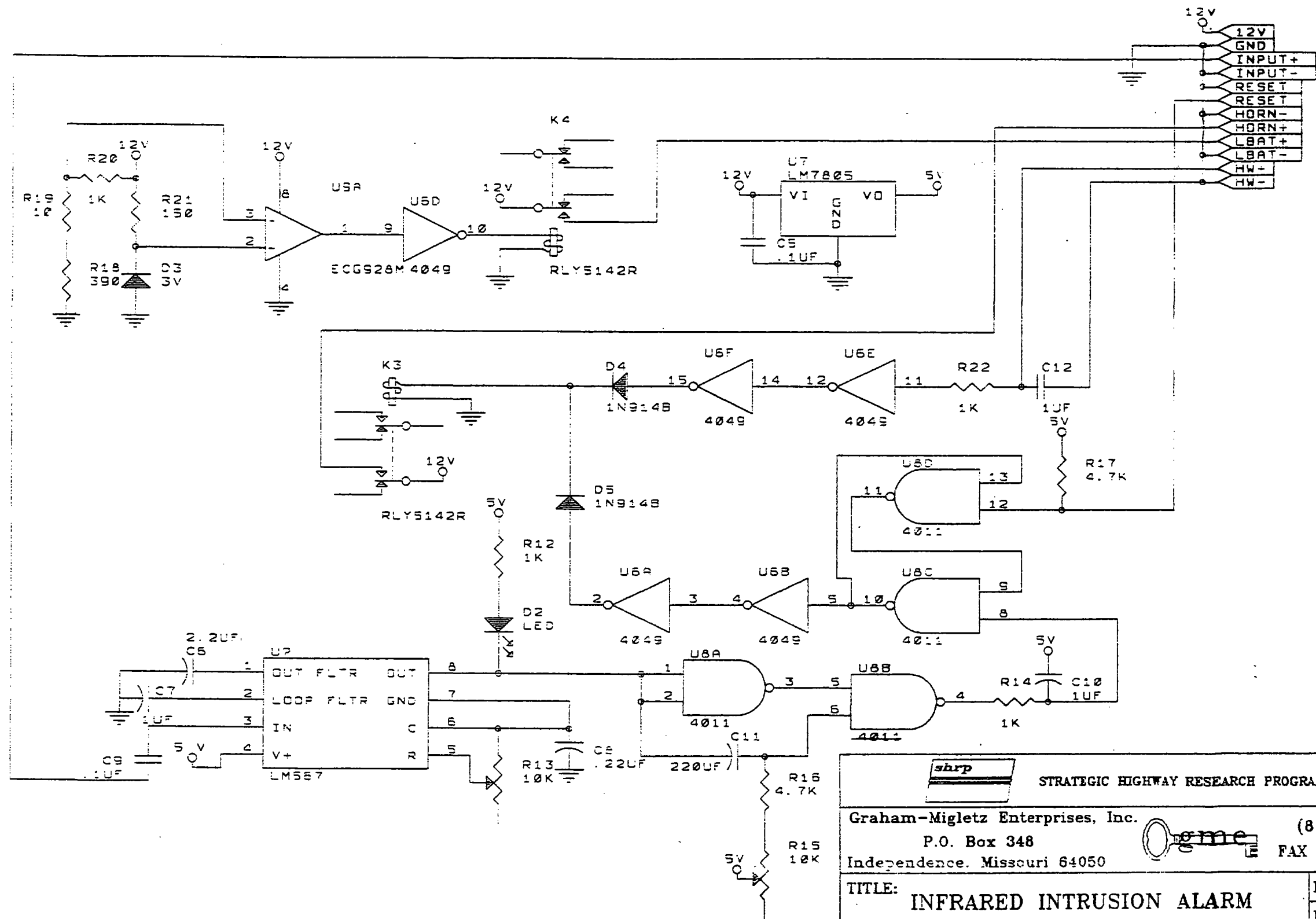



* TANTILUM CAPACITORS

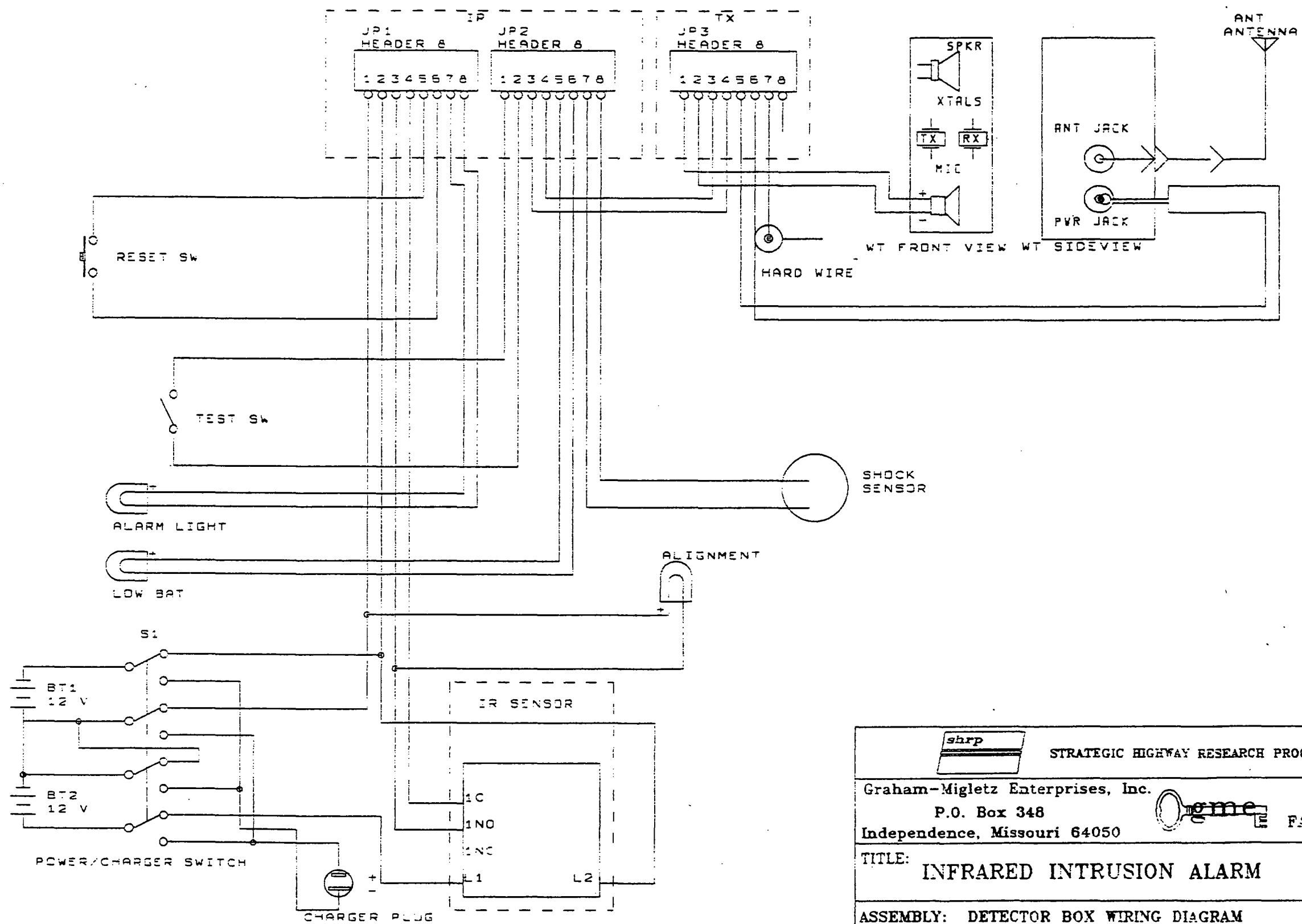


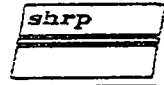
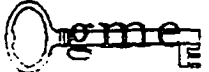
STRATEGIC HIGHWAY RESEARCH PROGRAM

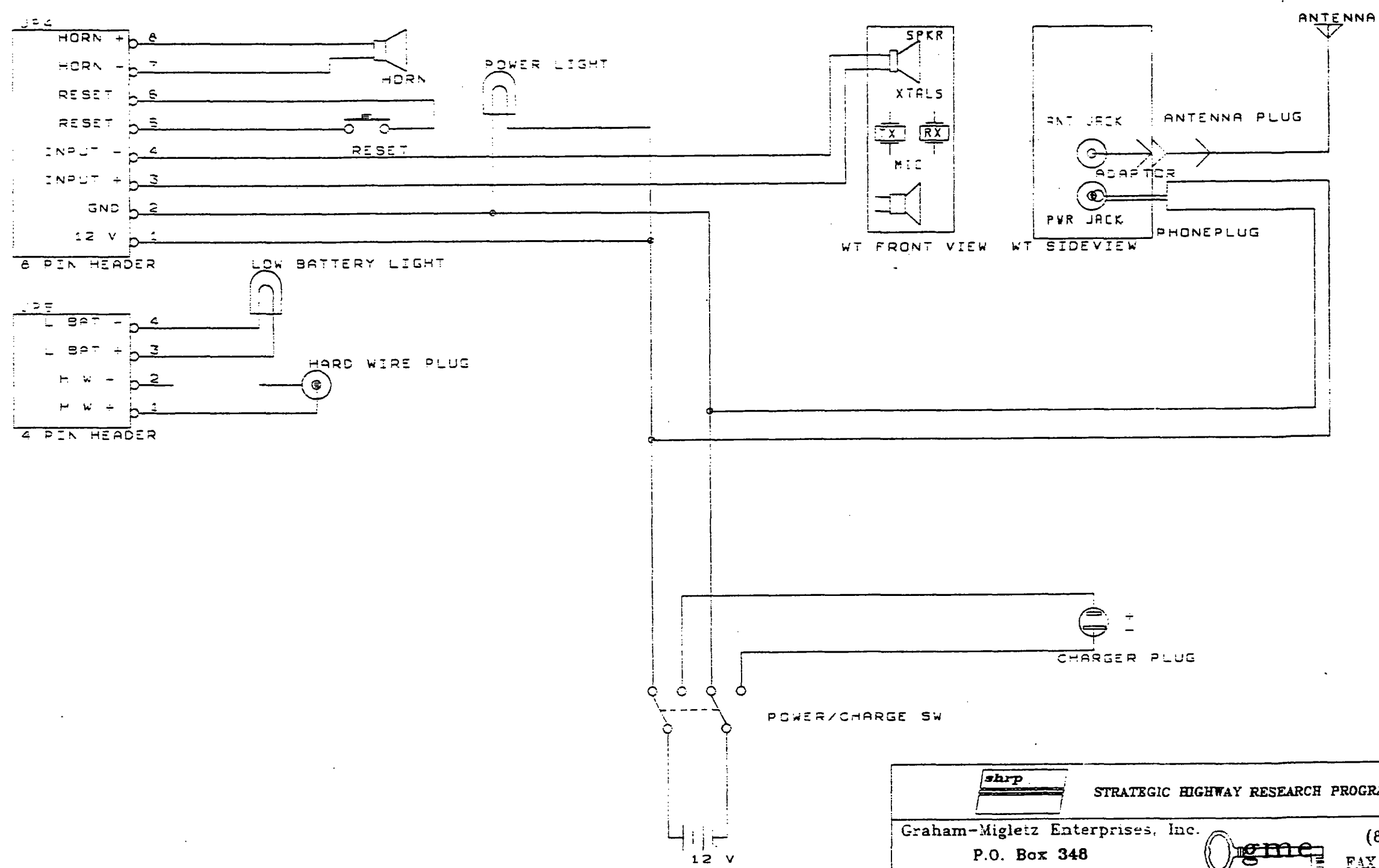
Graham-Migletz Enterprises, Inc.		(816) 254-1788	
P.O. Box 348		FAX (816) 254-4654	
Independence, Missouri 64050			
TITLE: INFRARED INTRUSION ALARM		DRAWN BY: BBF	
ASSEMBLY: RECEIVER BOARD STYLE/LAYOUT		REVISED: BBF	
DRAWING NUMBER: 23 OF 26		SCALE: NONE	
		DATE: 10-20-92	

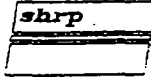


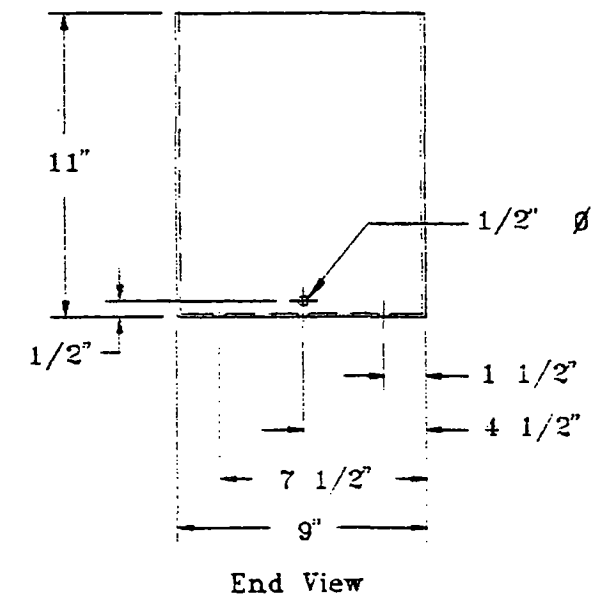
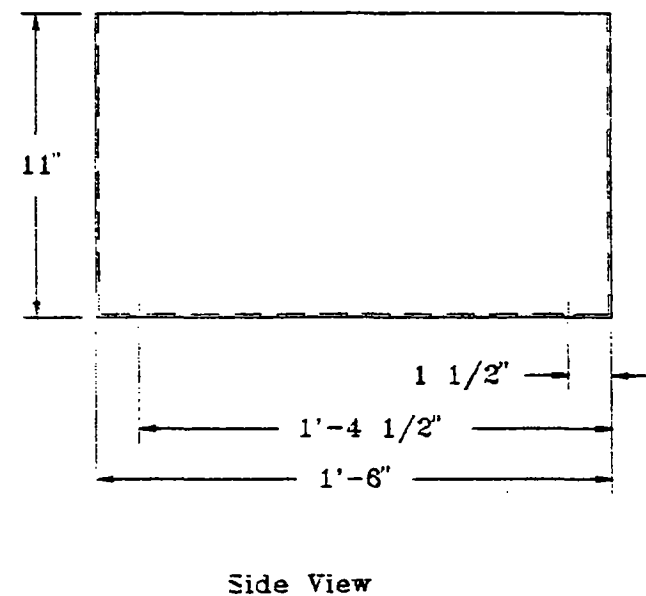
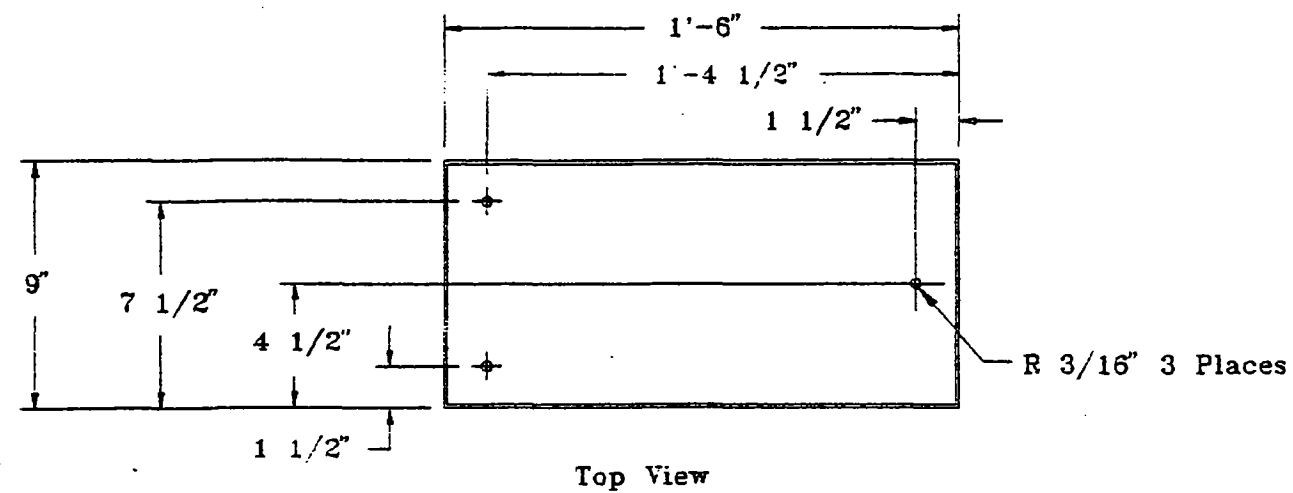
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. (816) 254-1788 P.O. Box 348 Independence, Missouri 64050 FAX (816) 254-4654	
TITLE: INFRARED INTRUSION ALARM	
DRAWN BY: BBF	
REVISED: BBF	
ASSEMBLY: RECEIVER BOARD STYLE/SYMBOLIC	
SCALE: NONE	
DRAWING NUMBER: 24 OF 26	
DATE: 10-20-92	



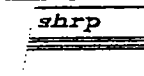
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: INFRARED INTRUSION ALARM	DRAWN BY: BBF
	REVISED: BBF
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	SCALE: NONE
DRAWING NUMBER: 25 OF 26	DATE: 10-20-92



		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: RECEIVER BOX WIRING DIAGRAM		SCALE: NONE	
DRAWING NUMBER: 26 OF 26		DATE: 10-20-92	

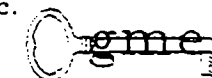


Note: Material of Box is 1/8" Aluminum.



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

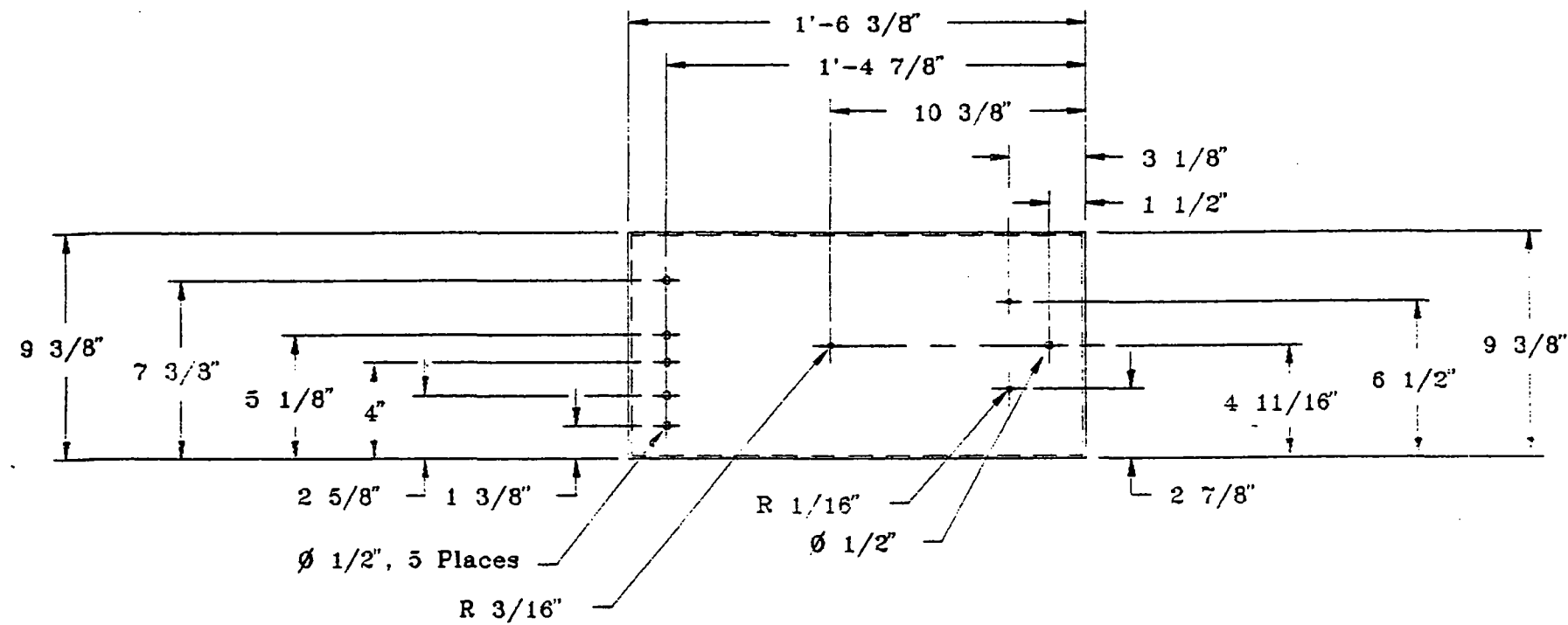
REVISED: ---

ASSEMBLY: Detector Box

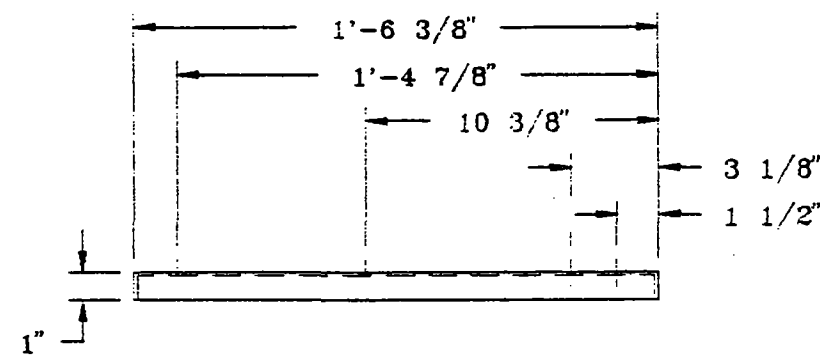
SCALE: None

DRAWING NUMBER: 1 of 10

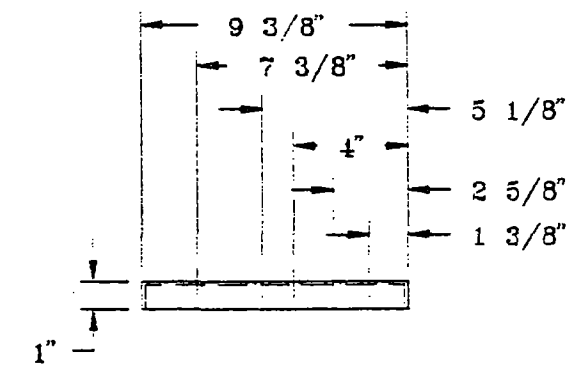
DATE: 8-26-92



Top View

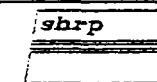


Side View



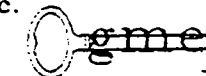
End View

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



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

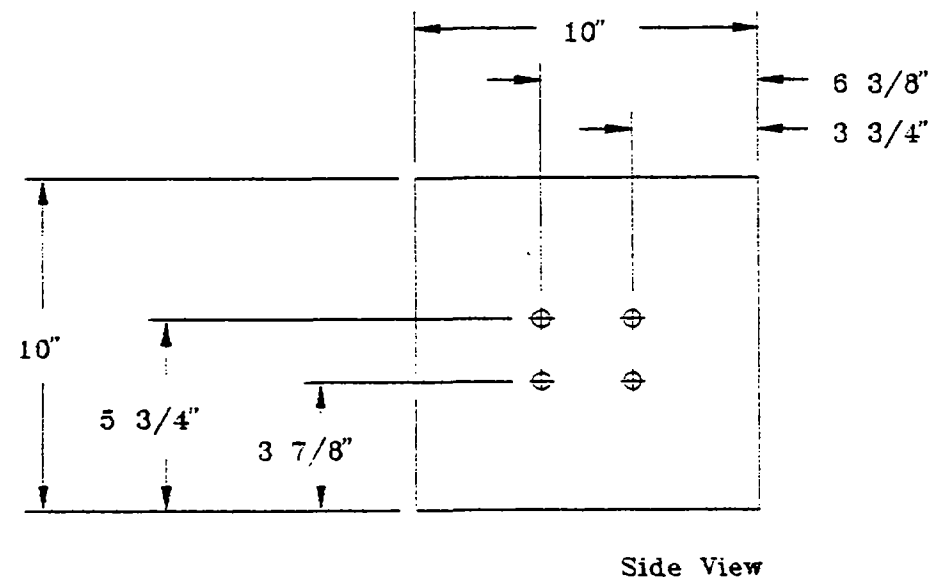
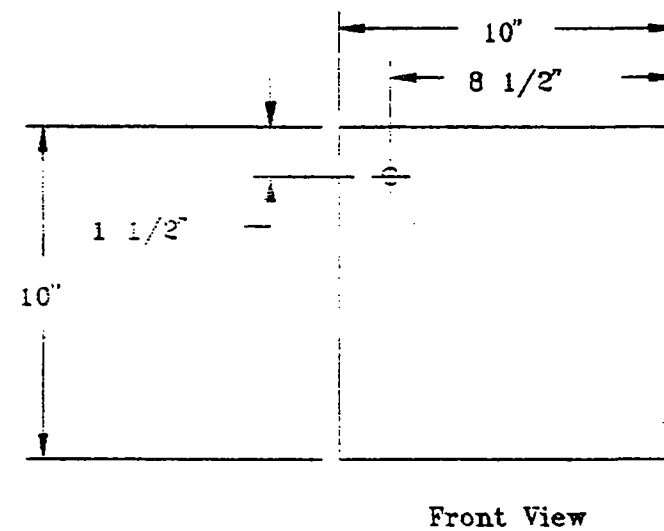
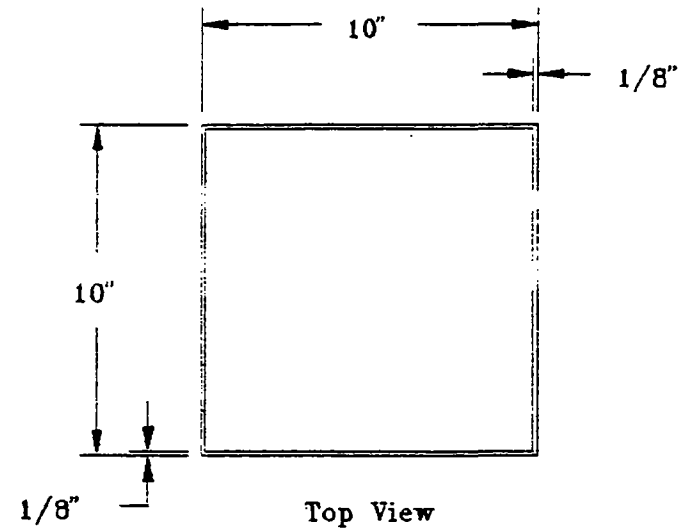
REVISED: ---

ASSEMBLY: Detector Lid

SCALE: None

DRAWING NUMBER: 2 of 10

DATE: 8-27-92



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



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

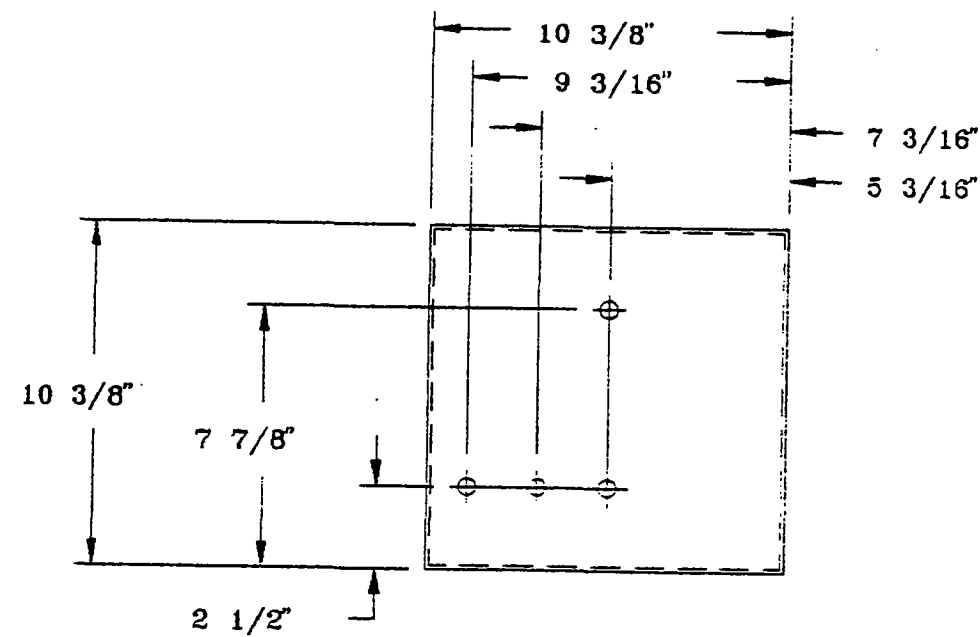
REVISED: ---

ASSEMBLY: Receiver Box

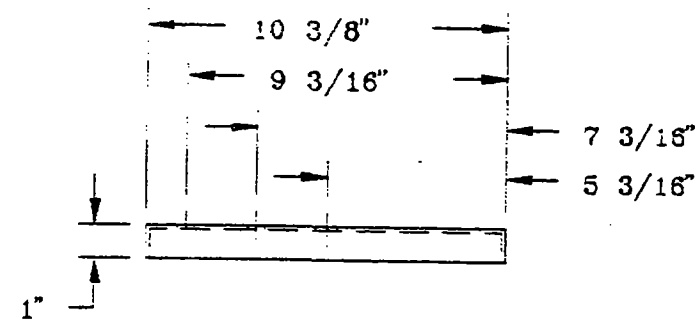
SCALE: None

DRAWING NUMBER: 3 of 10

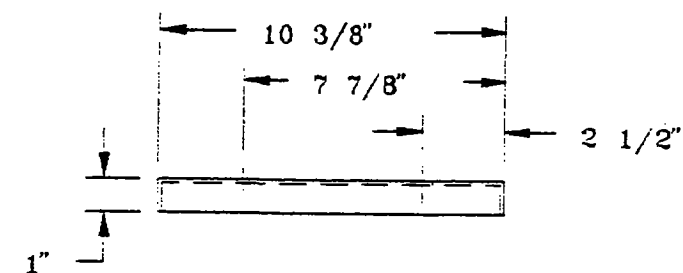
DATE: 07/16/92



Top View



Front View



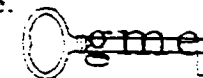
Side View

Note: Material of Lid is $\frac{1}{8}"$ Aluminum.



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: ---

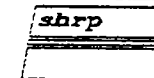
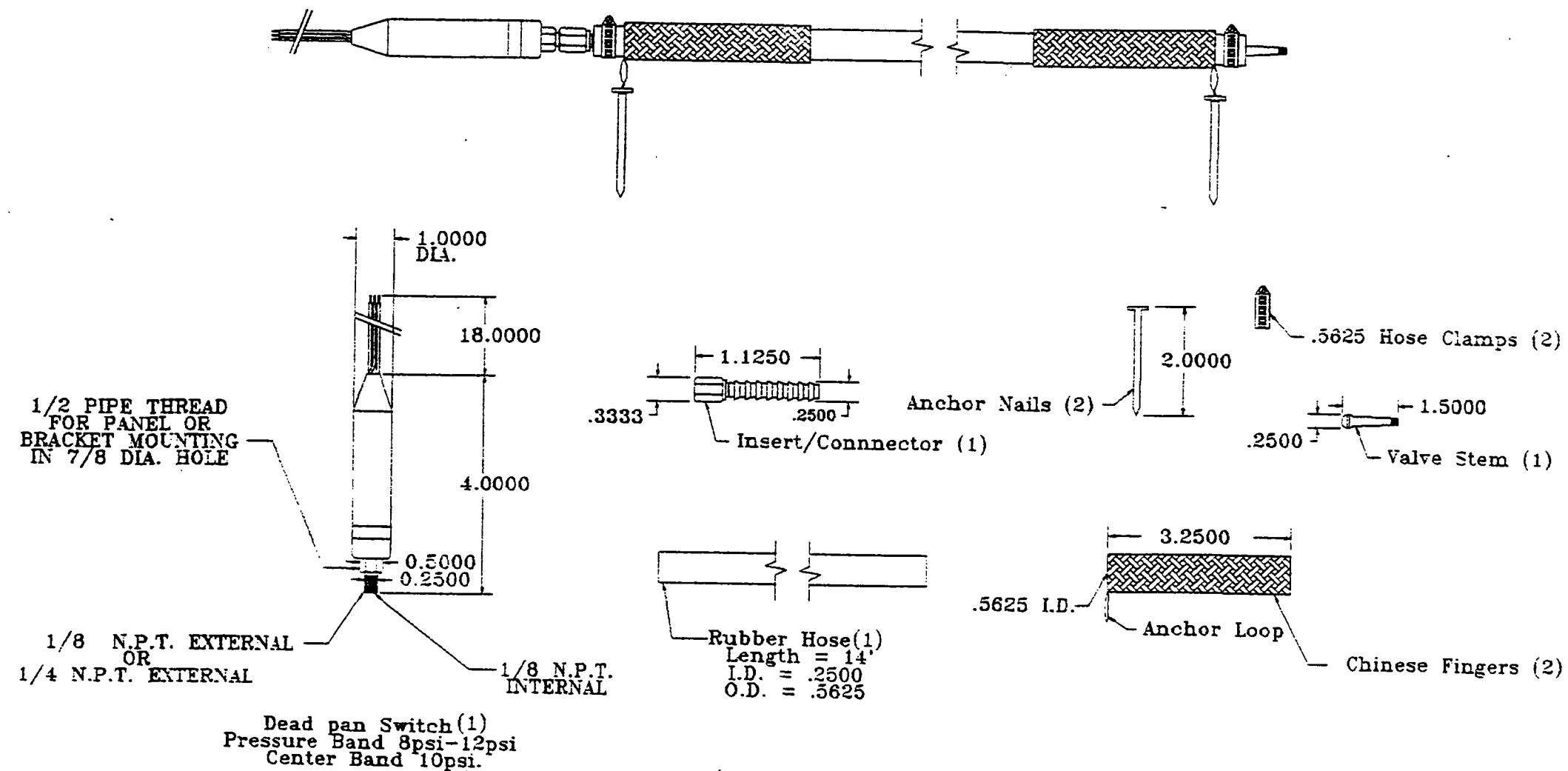
ASSEMBLY: Receiver Lid

SCALE: None

DRAWING NUMBER: 4 of 10

DATE: 07/17/92

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



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

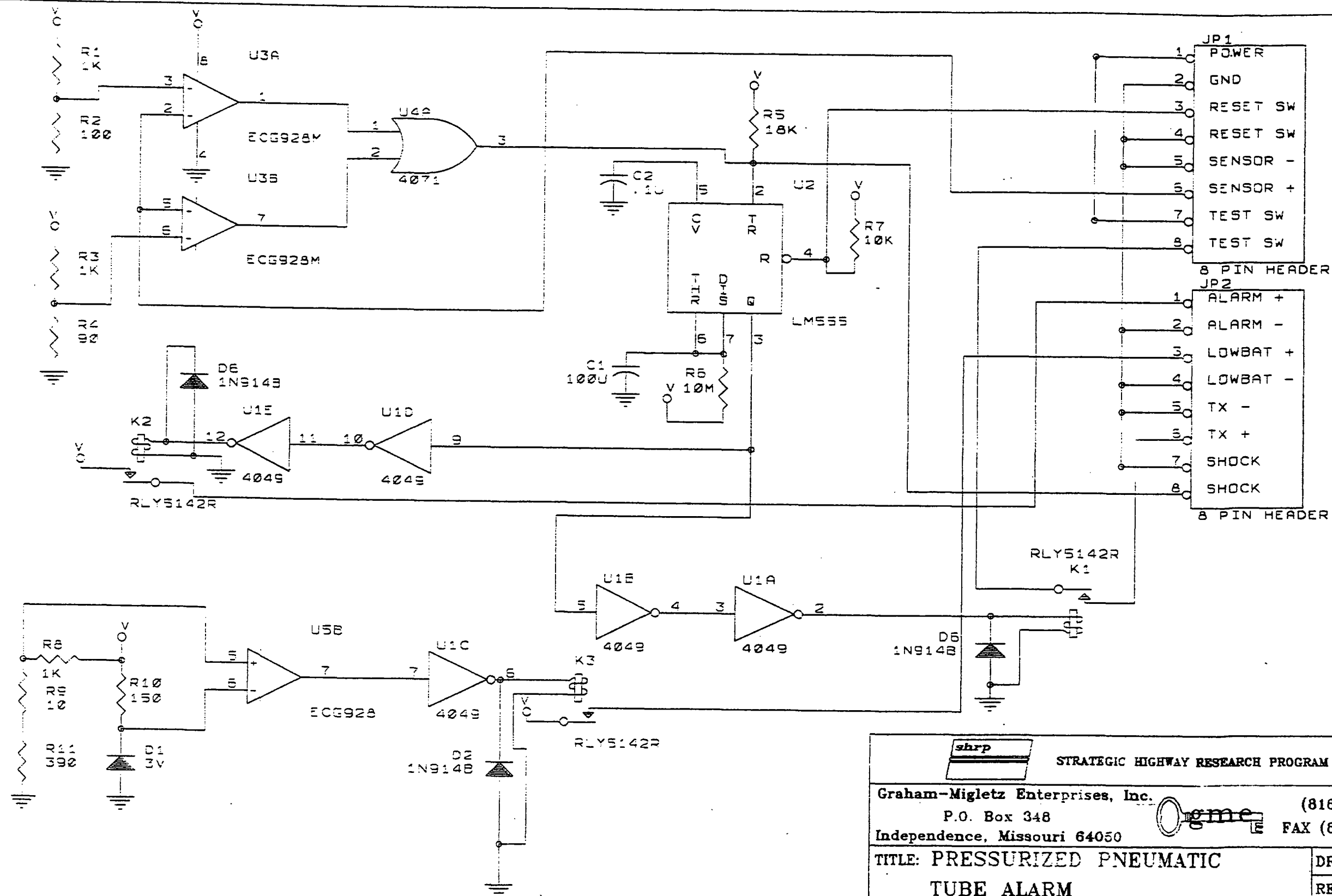
REVISED: ---

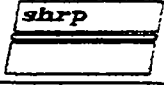
ASSEMBLY: Hose

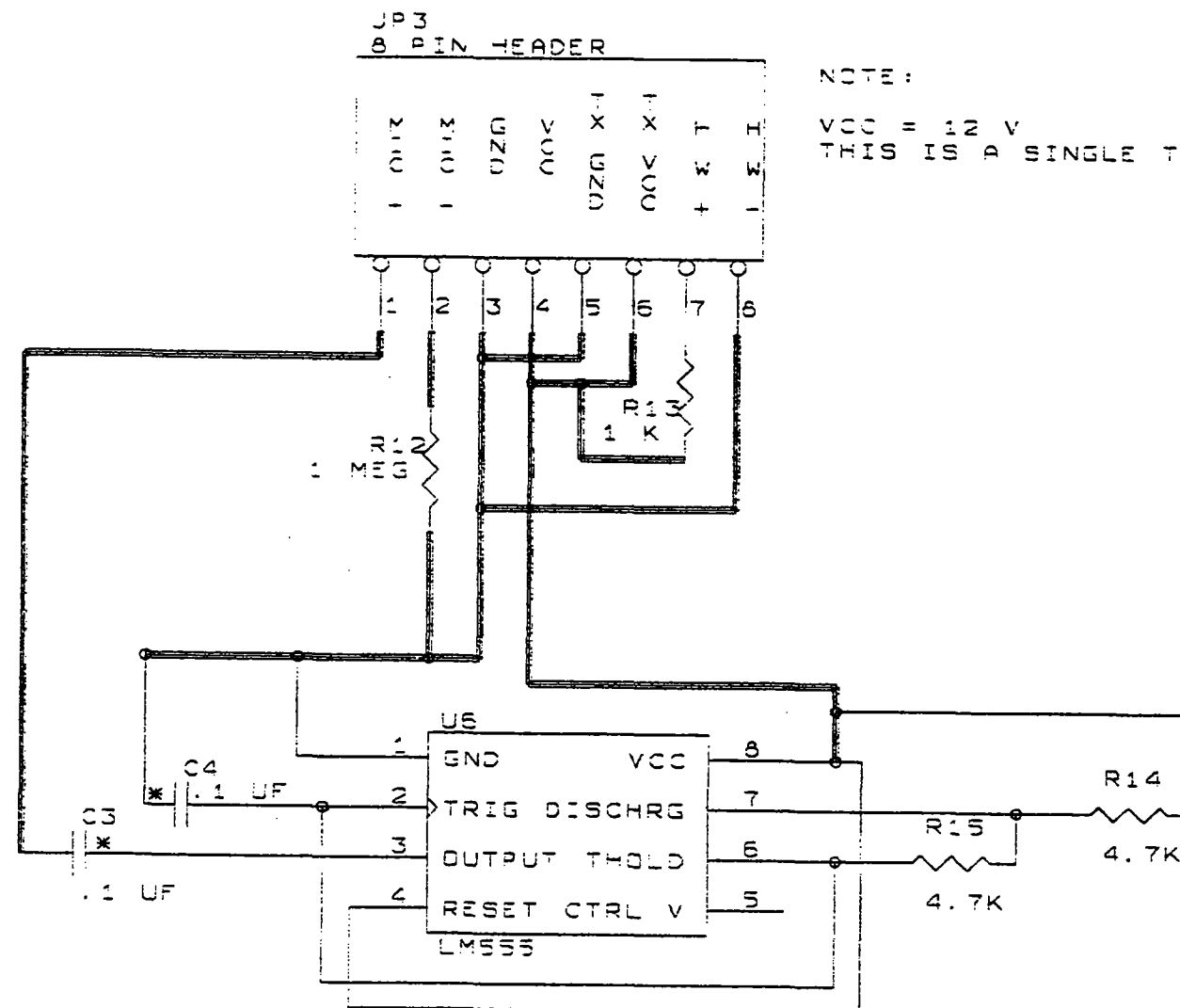
SCALE: None

DRAWING NUMBER: 5 of 10

DATE: 07/17/92



 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: SENSOR INTERFACE BOARD	REVISED: BBF
DRAWING NUMBER: 6 OF 10	SCALE: NONE
	DATE: 10-20-92

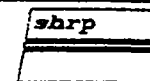


NOTE:

VCC = 12 V

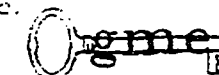
THIS IS A SINGLE TONE GENERATOR PRESET TO 1 KHZ

* TANTILUM CAPACITORS



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

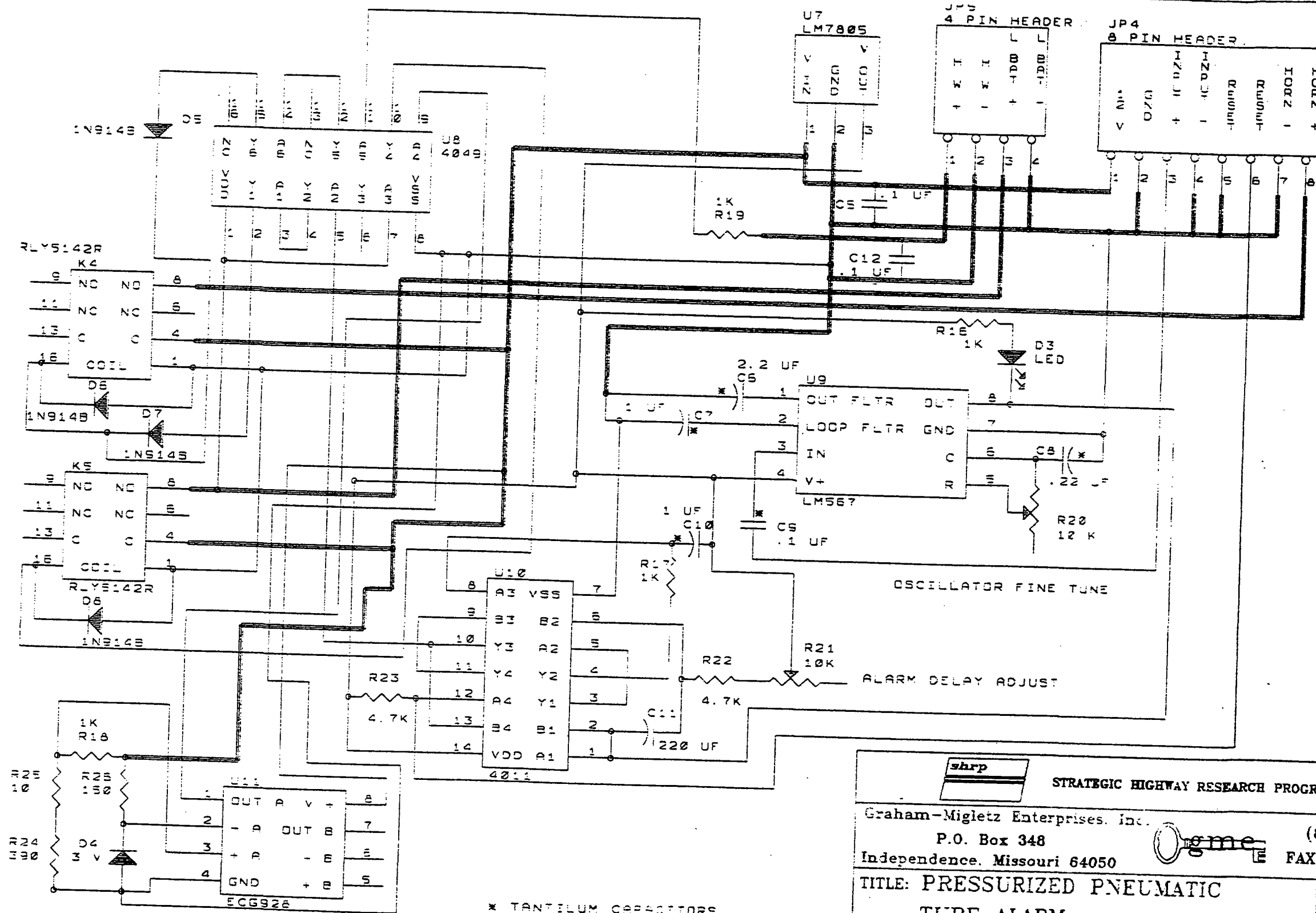
REVISED: BBF

ASSEMBLY: TRANSMITTER BOARD

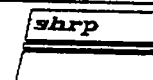
SCALE: NONE

DRAWING NUMBER: 7 OF 10

DATE: 10-20-92



* TANTILUM CAPACITORS



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

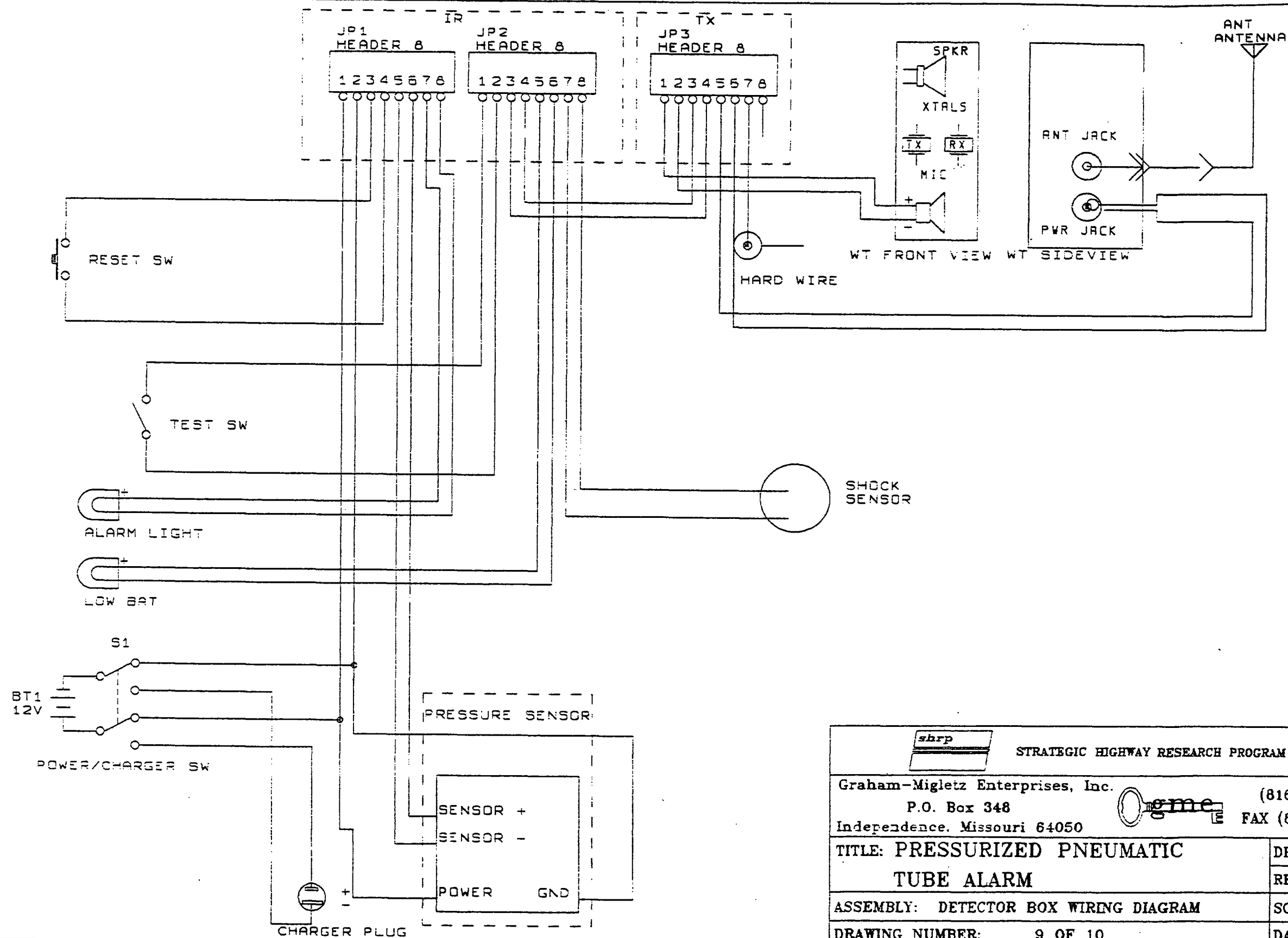
REVISED: BBF

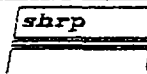

ASSEMBLY: RECEIVER BOARD

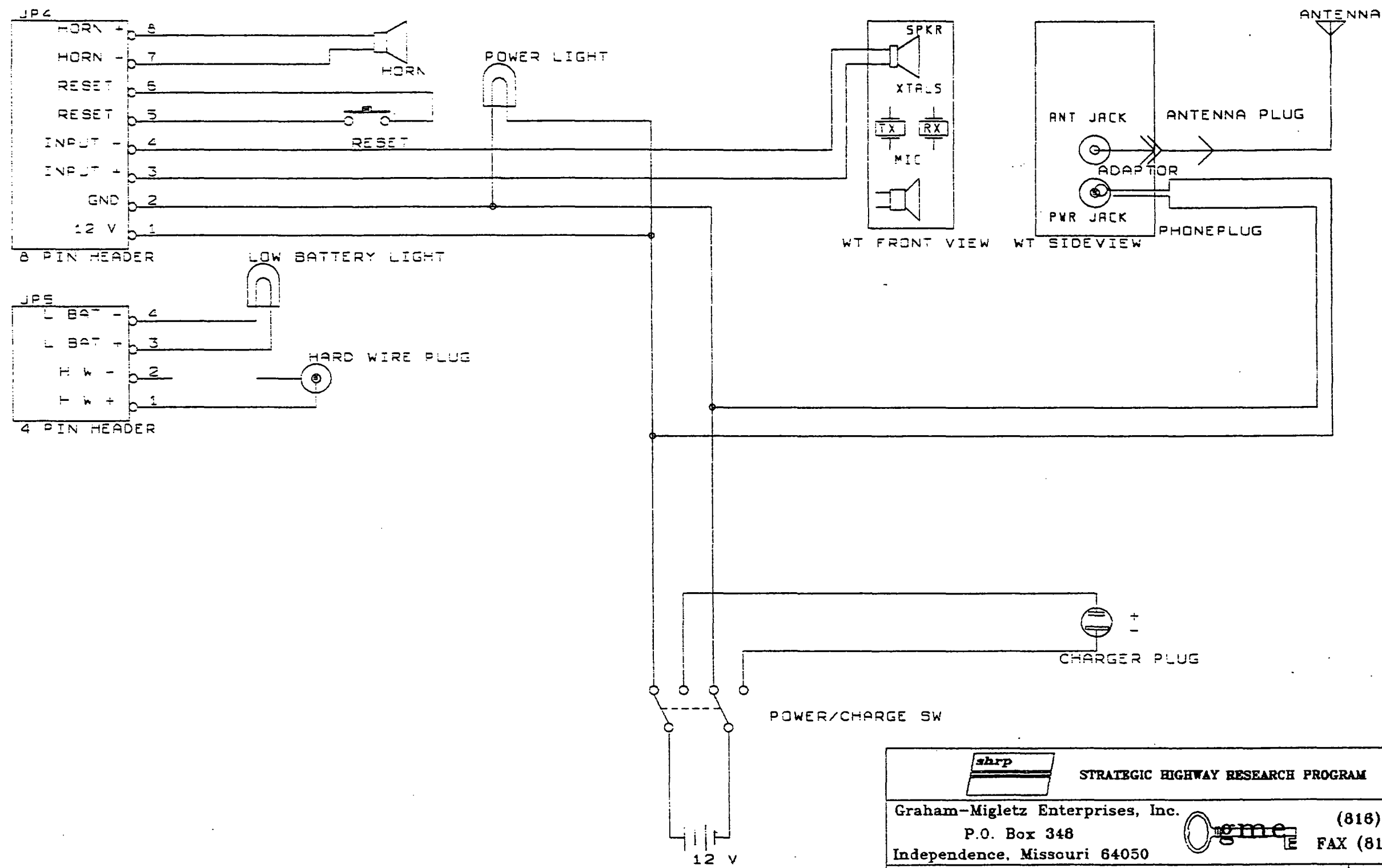
SCALE: NONE

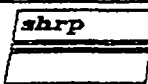
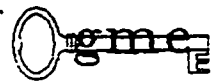
DRAWING NUMBER: 8 OF 10

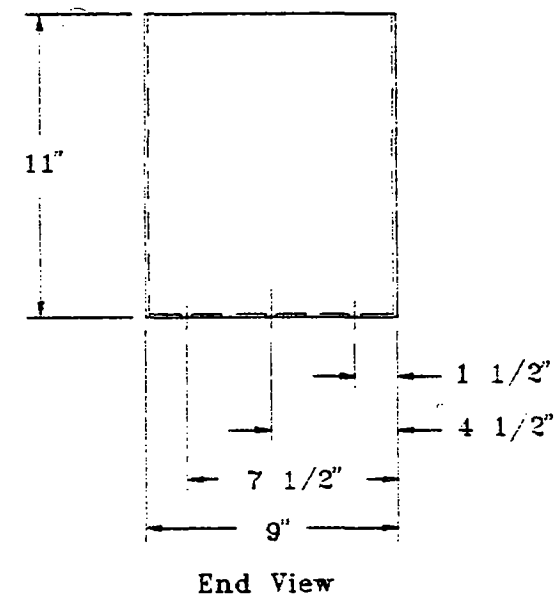
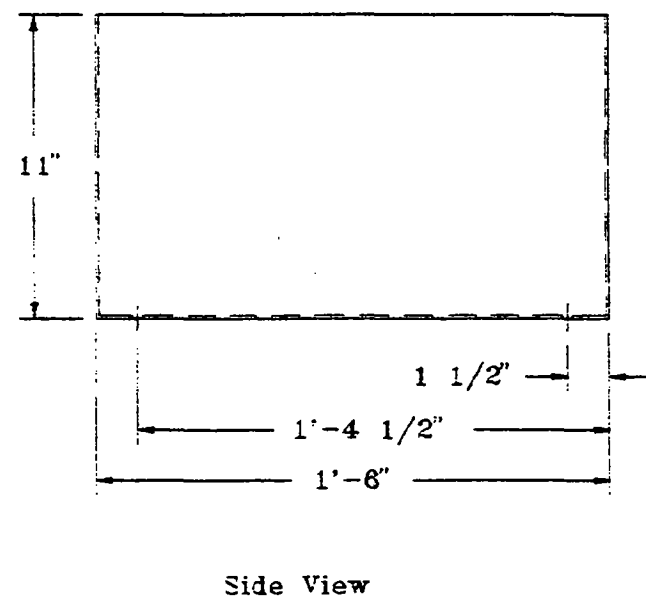
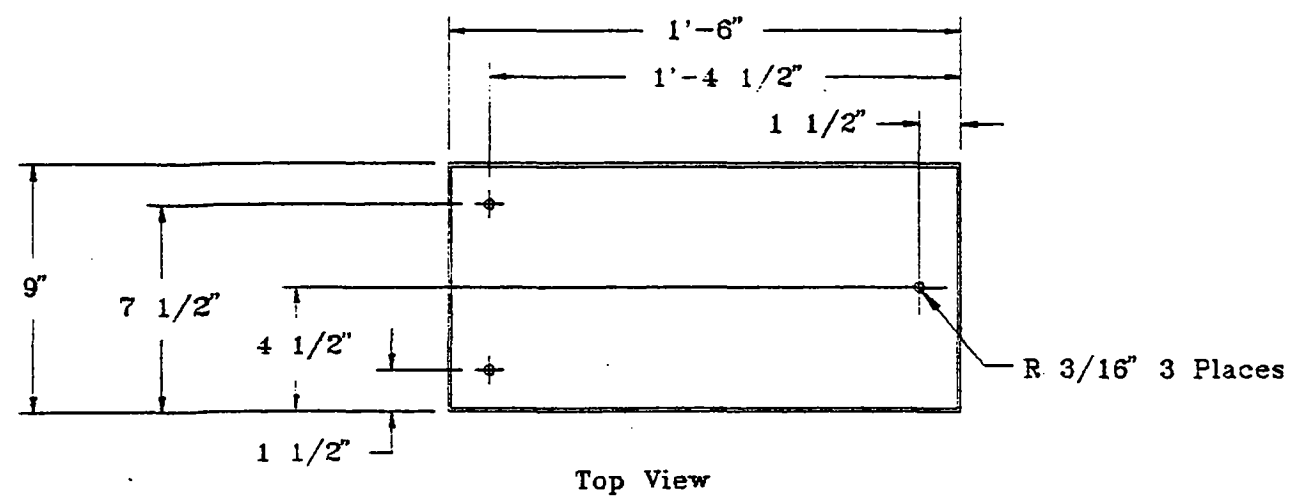
DATE: 10-20-92




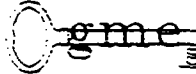
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM	DRAWN BY: BBF REVISED: BBF
ASSEMBLY: DETECTOR BOX WIRING DIAGRAM	SCALE: NONE
DRAWING NUMBER: 9 OF 10	DATE: 10-20-92

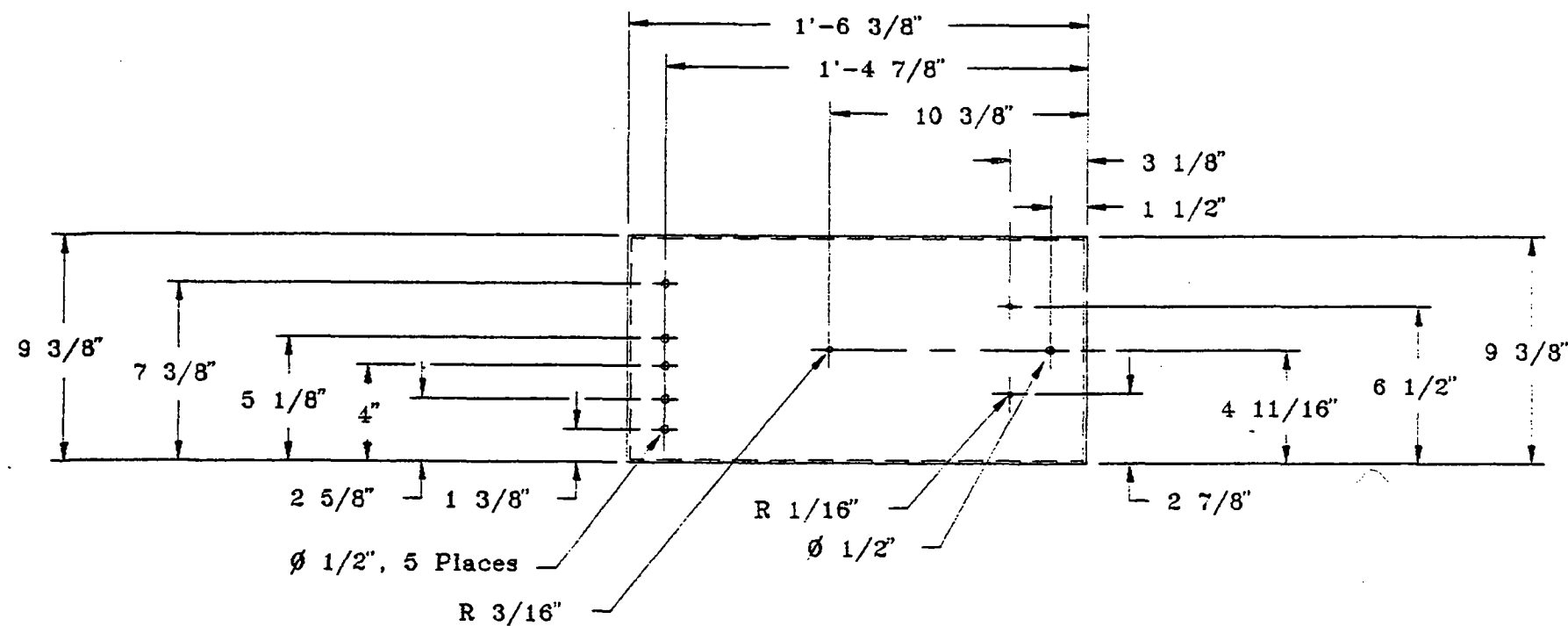


 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: PRESSURIZED PNEUMATIC TUBE ALARM	DRAWN BY: BBF REVISED: BBF
ASSEMBLY: RECEIVER BOX WIRING DIAGRAM	SCALE: NONE
DRAWING NUMBER: 10 OF 10	DATE: 10-20-92

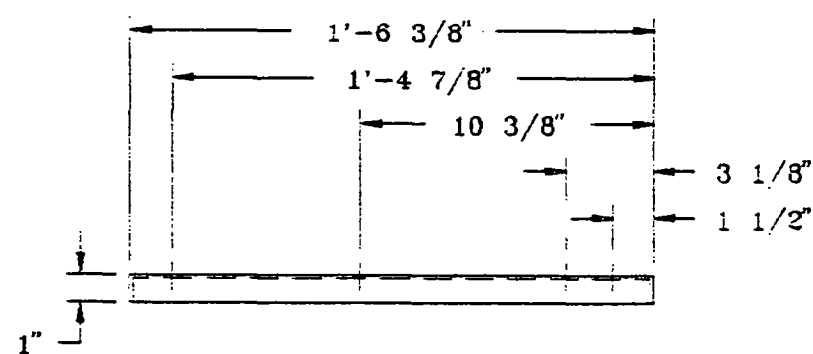


Note: Material of Box is 1/8" Aluminum.

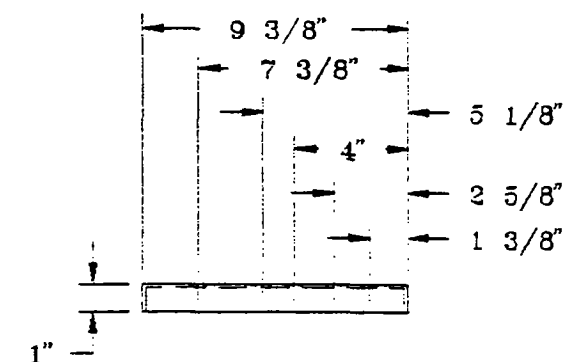
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	Queue Length Detector
ASSEMBLY:	Box
DRAWING NUMBER:	1 of 13
DRAWN BY:	JMM
REVISD:	---
SCALE:	None
DATE:	8-26-92



Top View



Side View



End View

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

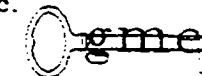


STRATEGIC HIGHWAY RESEARCH PROGRAM

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

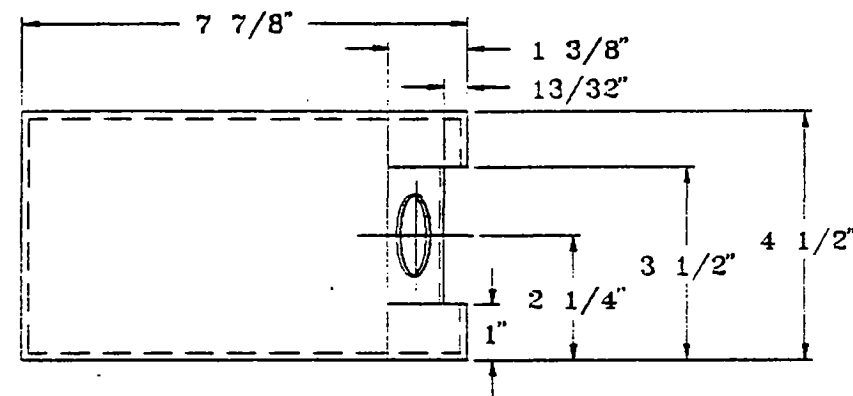
REVISED: ---

ASSEMBLY: Lid

SCALE: None

DRAWING NUMBER: 2 of 13

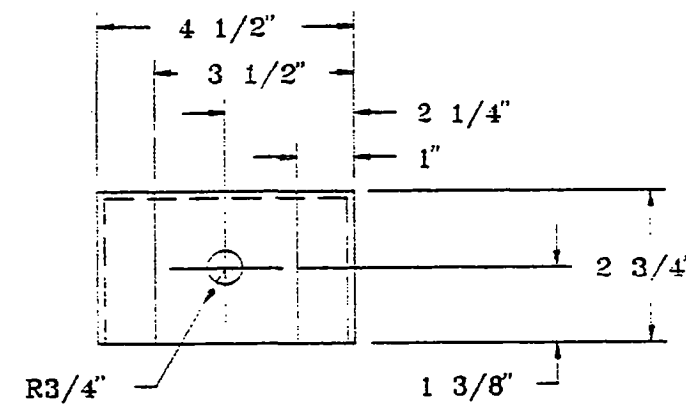
DATE: 8-27-92



Top View

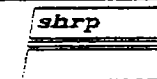


Side View



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



(816) 254-1788

FAX (816) 254-4654

TITLE: Queue Length Detector

DRAWN BY: JMM

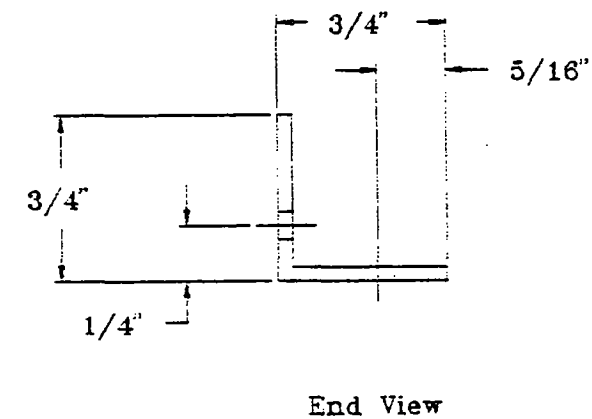
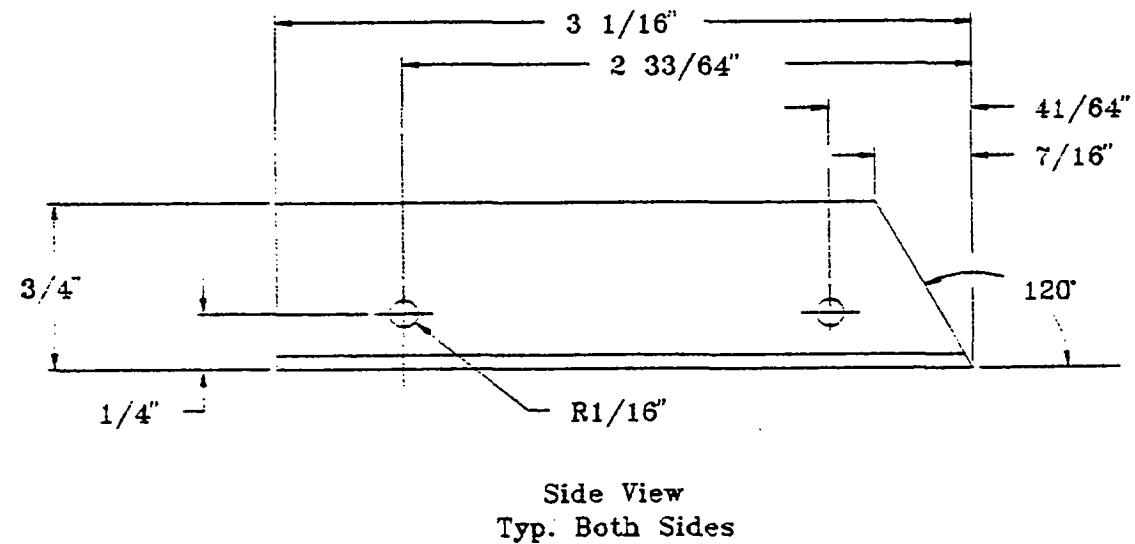
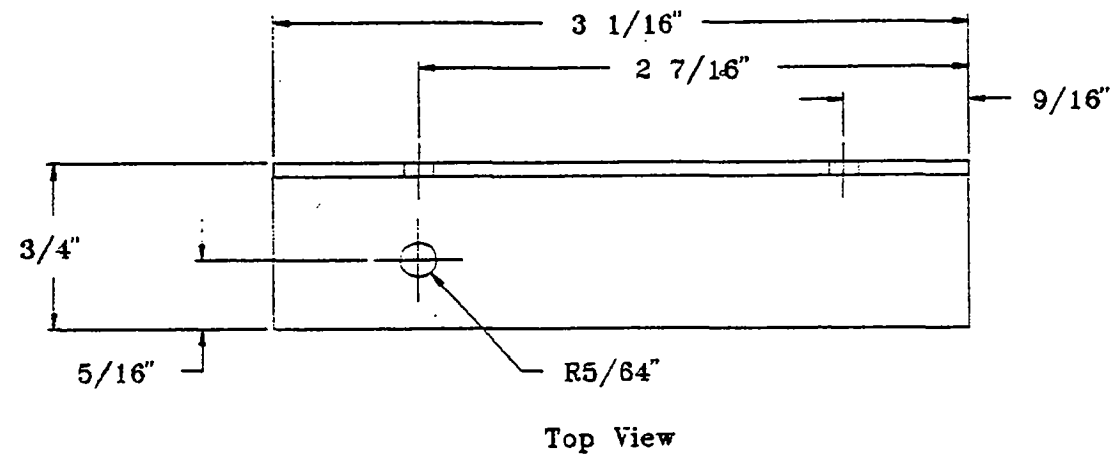
REVISED: ---

ASSEMBLY: Hood

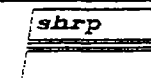
SCALE: None

DRAWING NUMBER: 3 of 13

DATE: 8-27-92

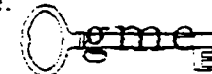


Note: Material of Mount is 3/32" Aluminum.



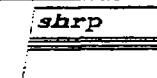
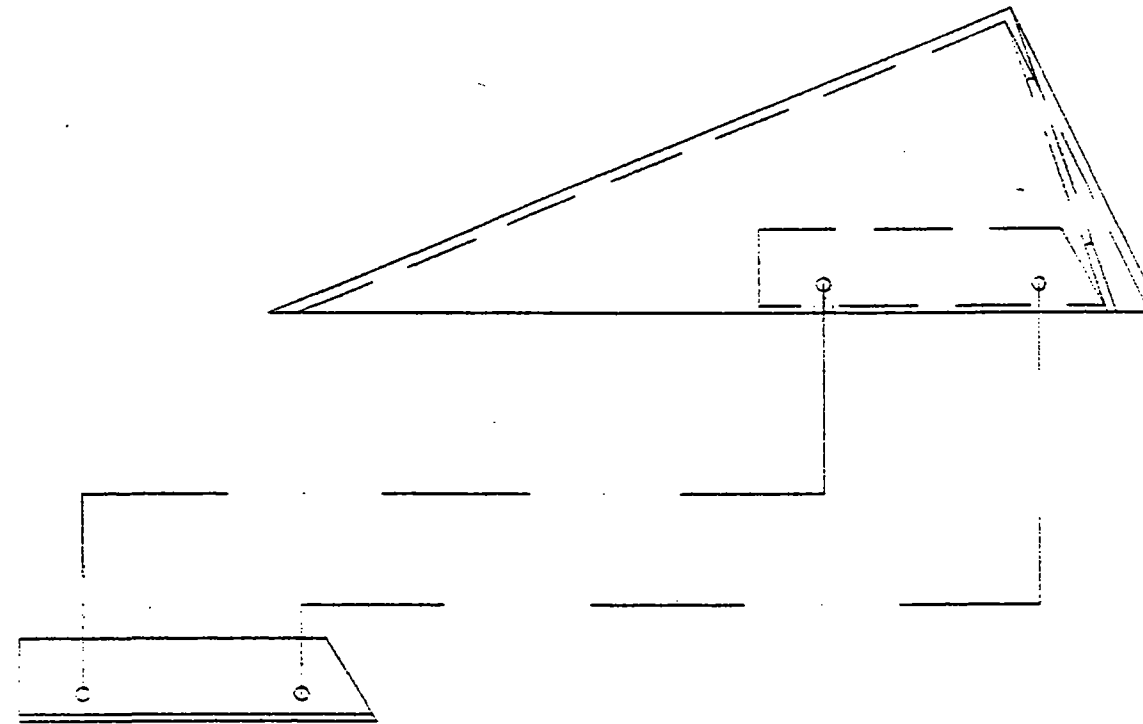
STRATEGIC HIGHWAY RESEARCH PROGRAM

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



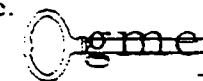
(816) 254-1788
FAX (816) 254-4654

TITLE:	Queue Length Detector	DRAWN BY: JMM
ASSEMBLY:	Hood Mount	REVISED: ---
DRAWING NUMBER:	4 of 13	SCALE: None
		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: Queue Length Detector

DRAWN BY: JMM

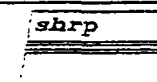
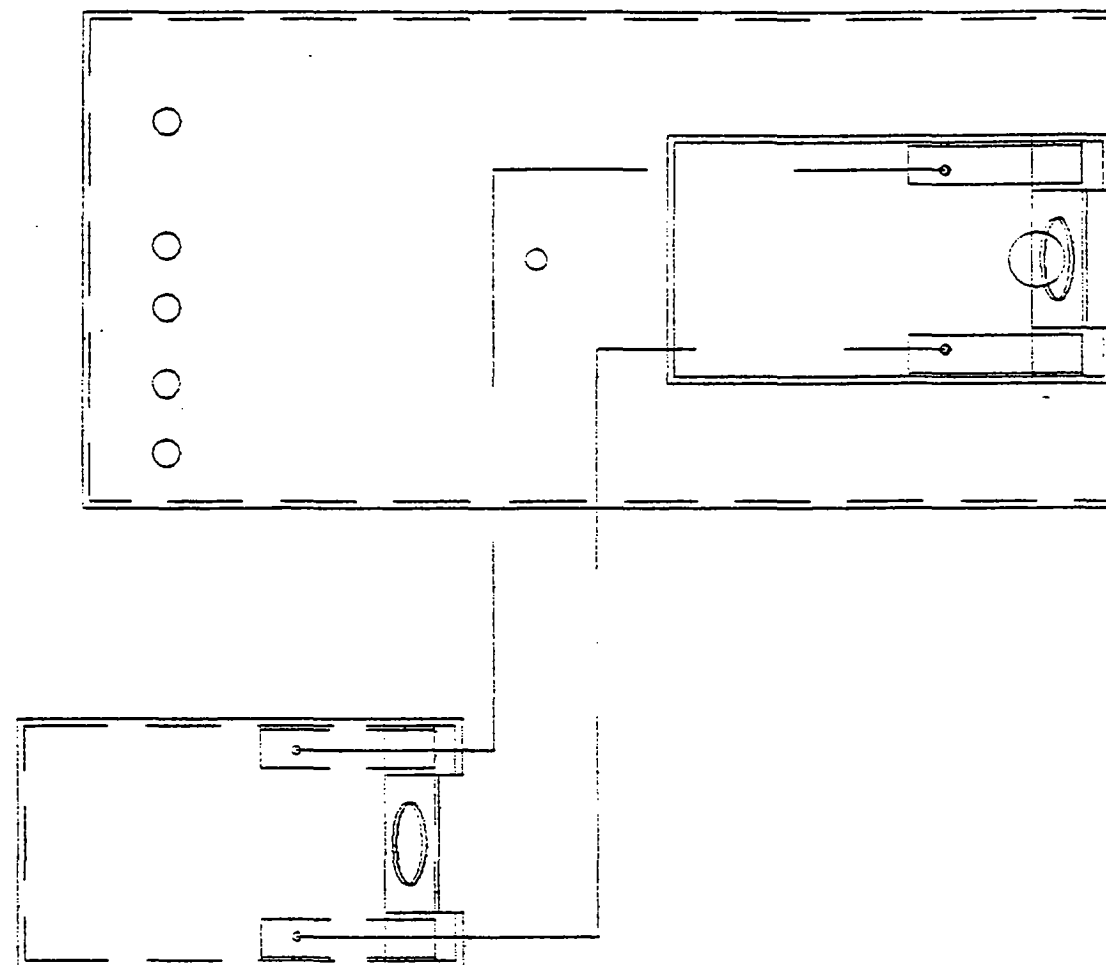
REVISED: ---

ASSEMBLY: Mount to Hood

SCALE: None

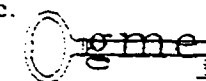
DRAWING NUMBER: 5 of 13

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: Queue Length Detector

DRAWN BY: JMM

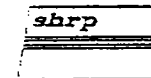
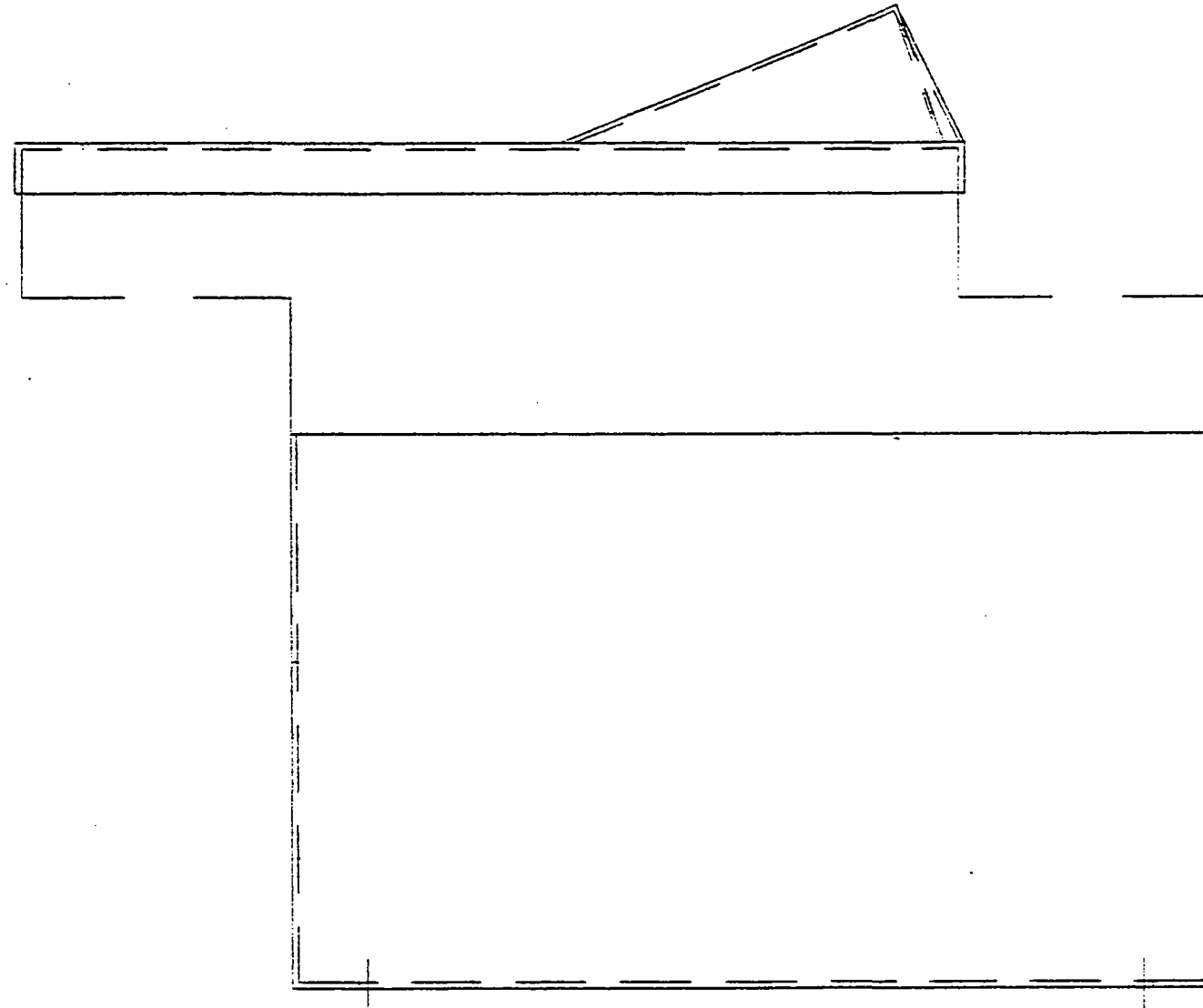
REVISED: ---

ASSEMBLY: Hood to Lid

SCALE: None

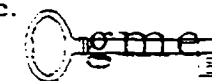
DRAWING NUMBER: 6 of 13

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: Queue Length Detector

DRAWN BY: JMM

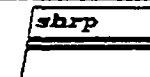
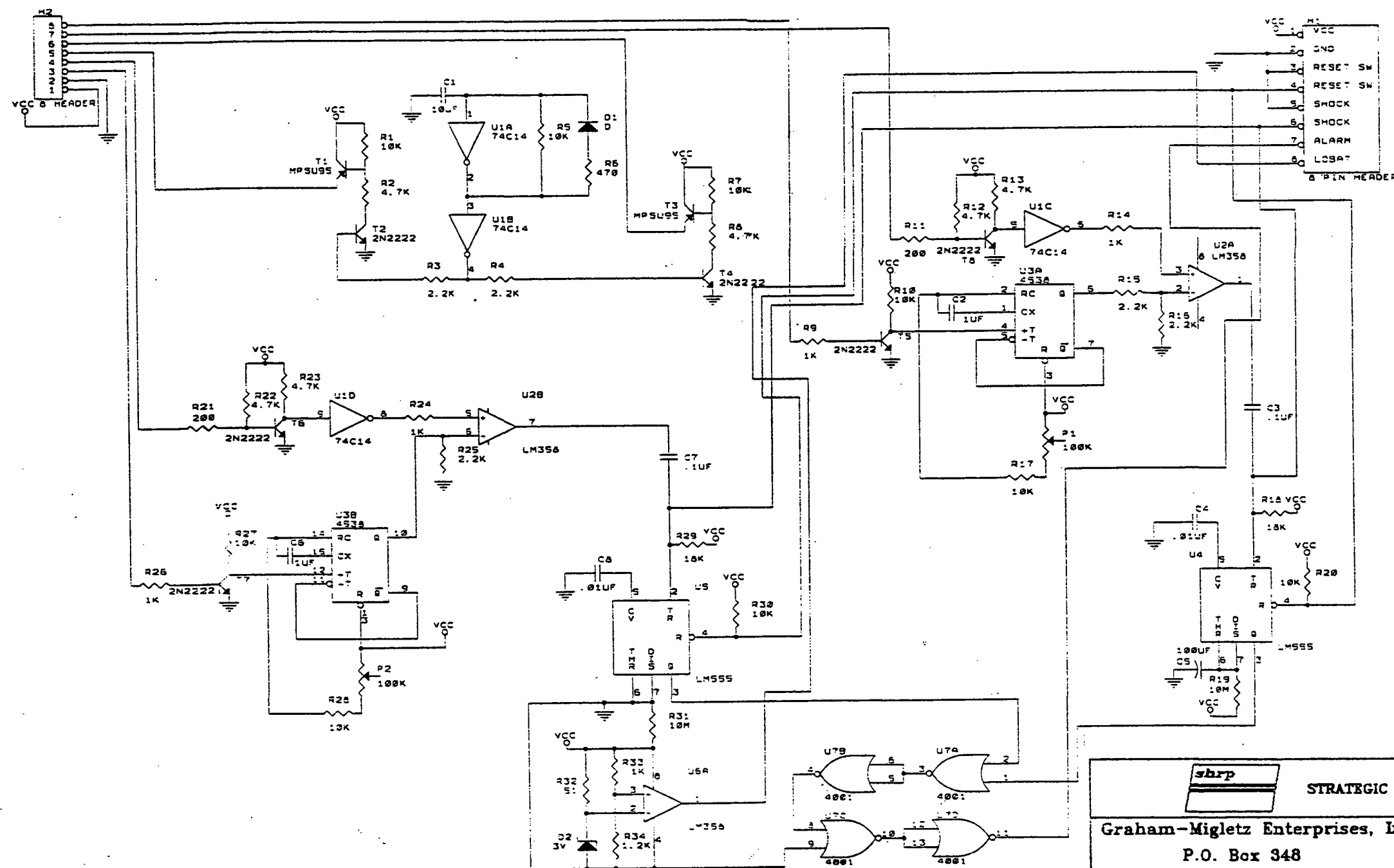
REVISED: ---

ASSEMBLY: Lid to Box

SCALE: None

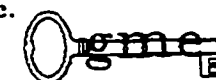
DRAWING NUMBER: 7 of 13

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: QUE LENGTH DETECTOR

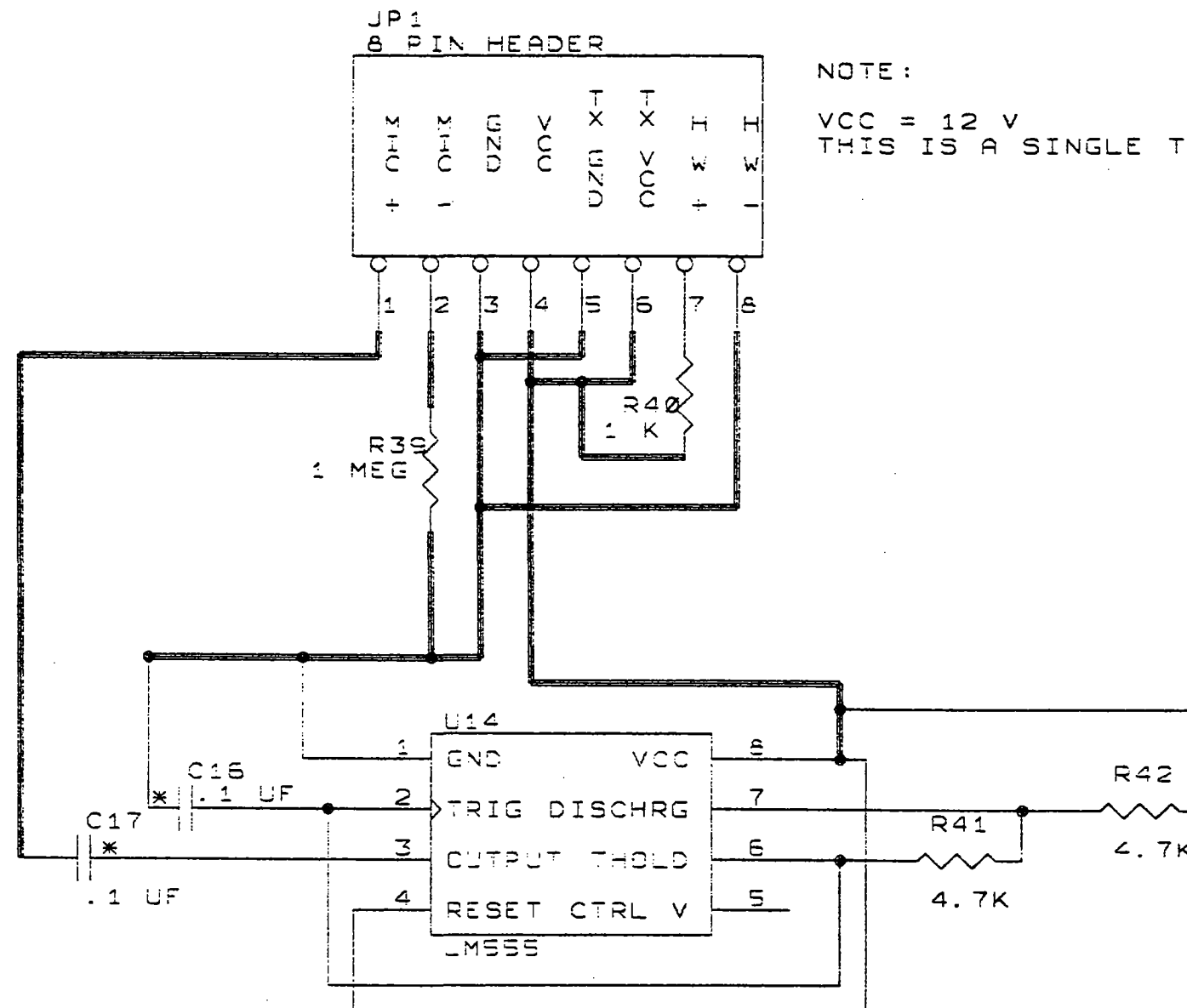
DRAWN BY: BBF
REVISED: BBF

ASSEMBLY: SENSOR BOARD

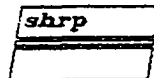
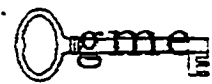
SCALE: NONE

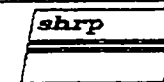
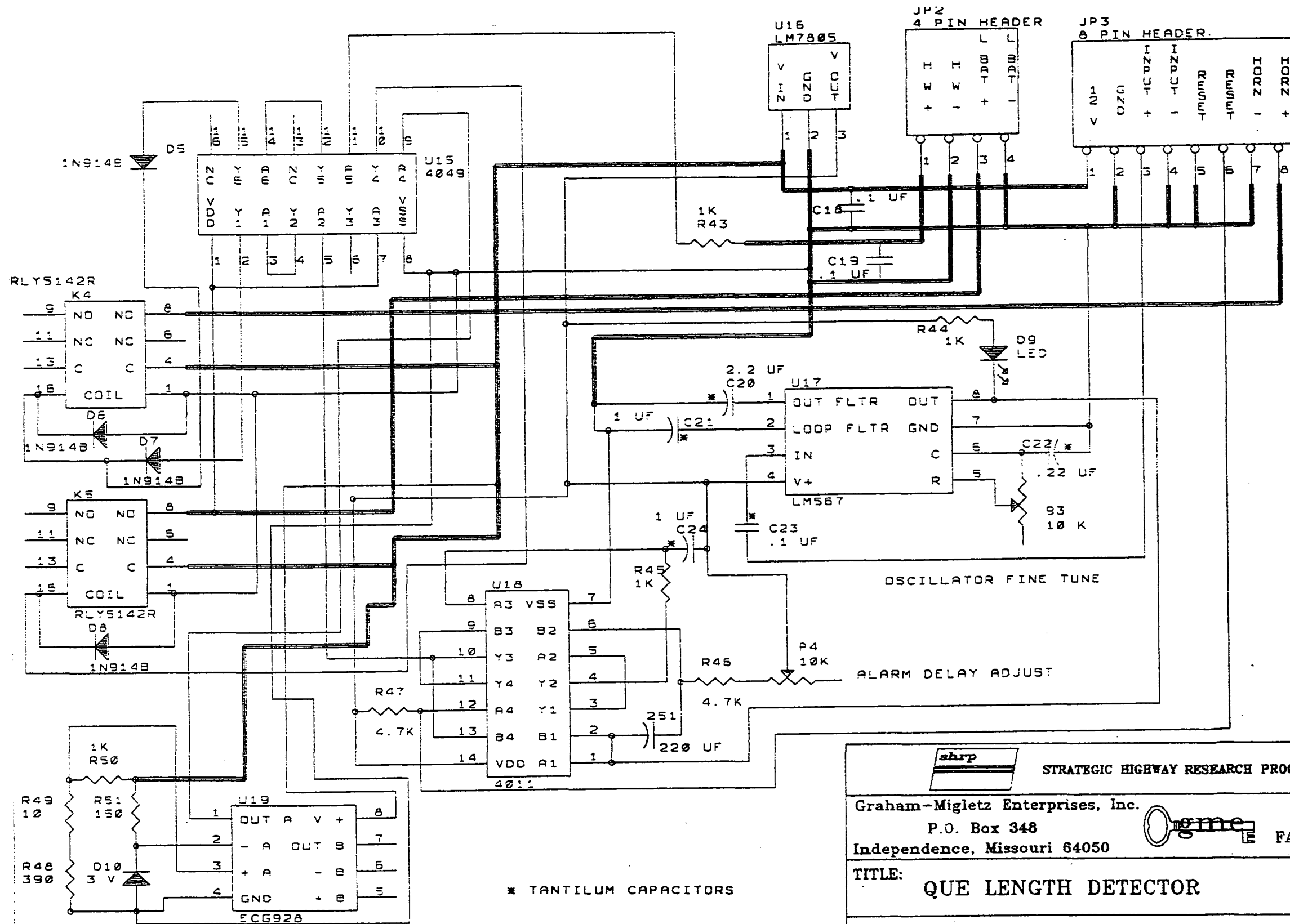
DRAWING NUMBER: 8 OF 13

DATE: 10-20-92



* TANTILUM CAPACITORS

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



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050

(816) 254-1788

FAX (816) 254-4654

TITLE:

QUE LENGTH DETECTOR

DRAWN BY: BBF

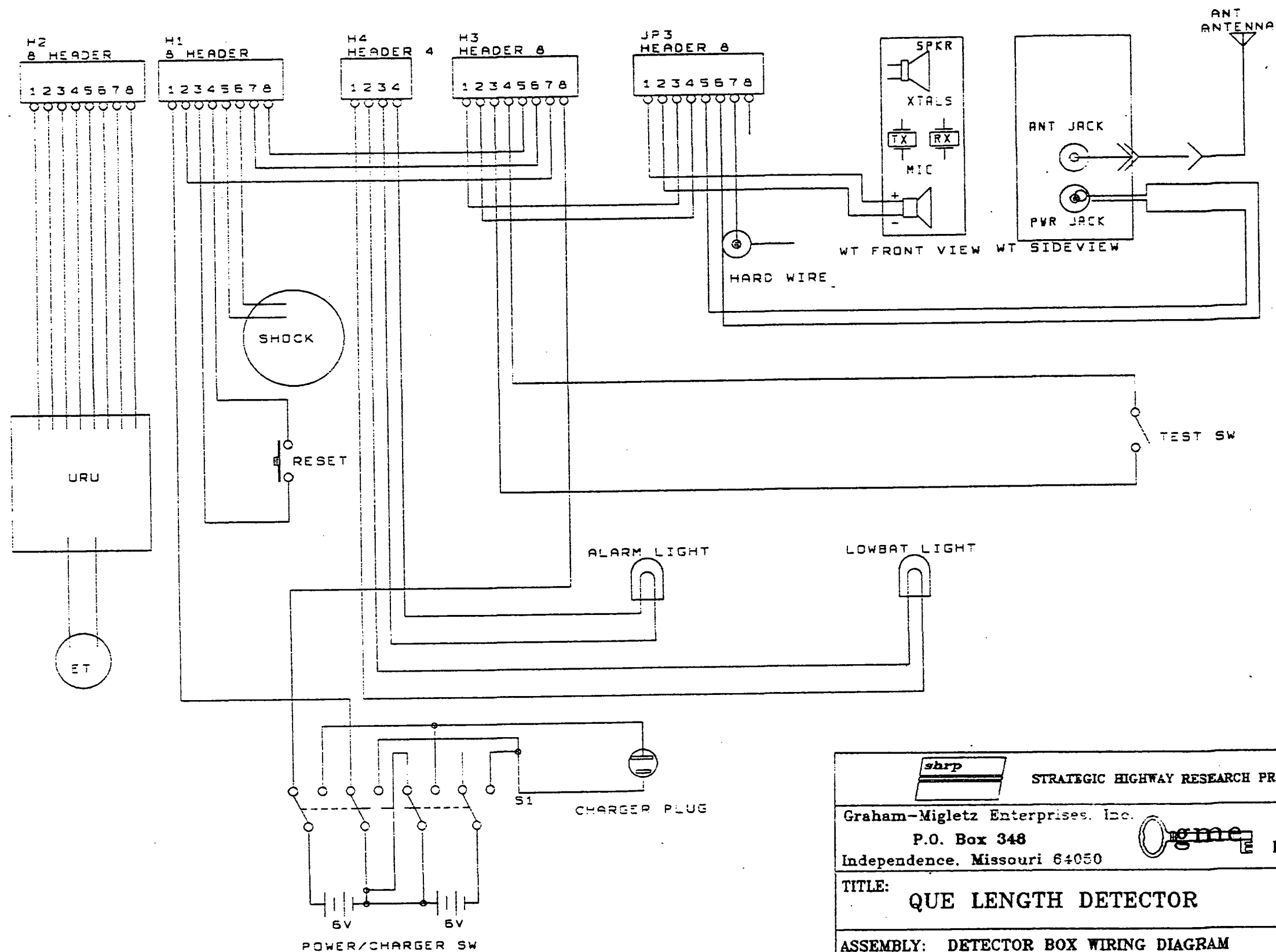
REVISED: BBF

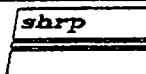
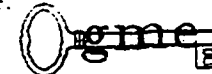
ASSEMBLY: RECEIVER BOARD

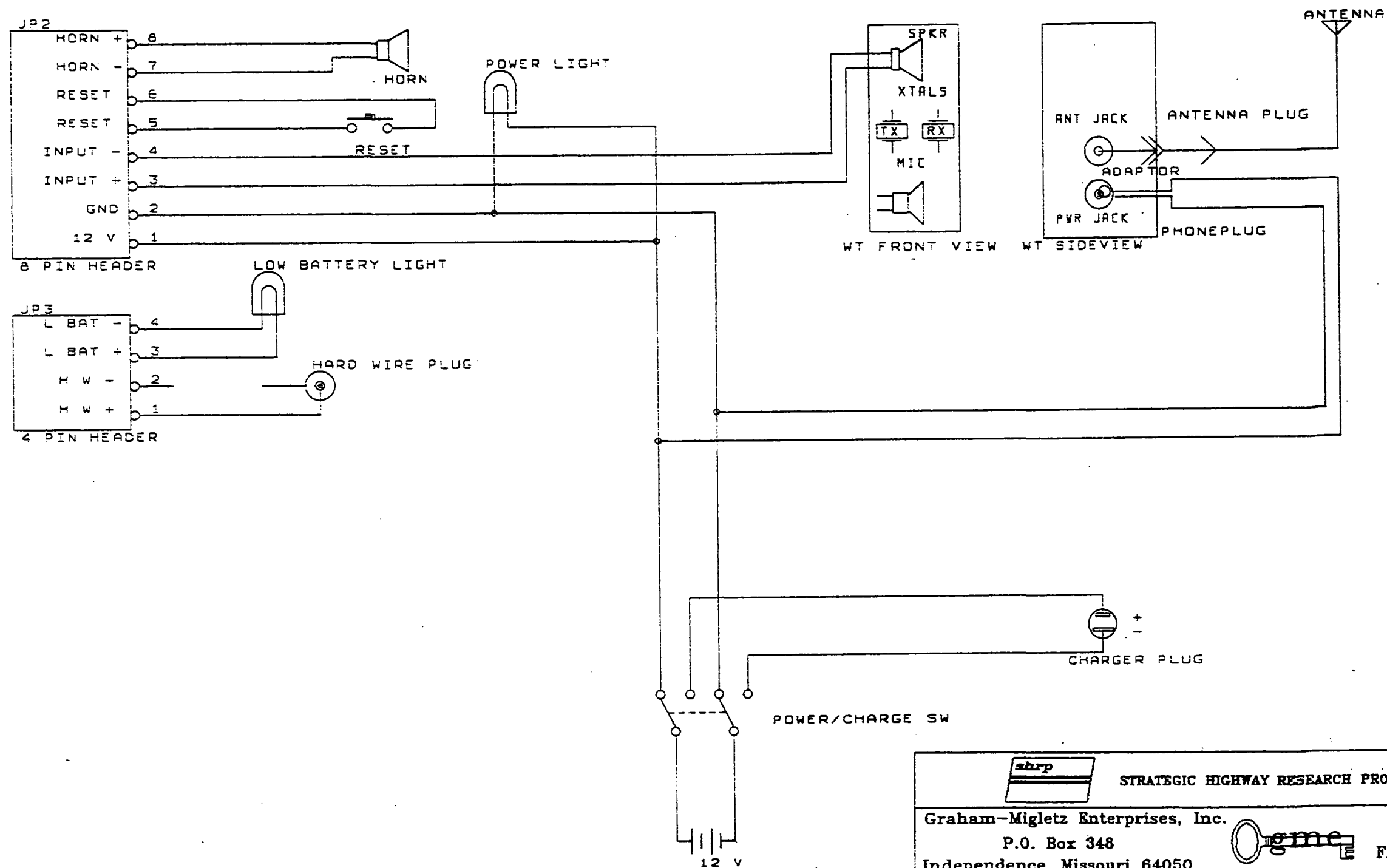
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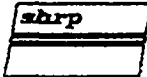
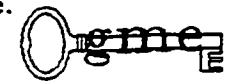
DRAWING NUMBER: 11 OF 13

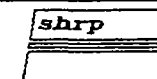
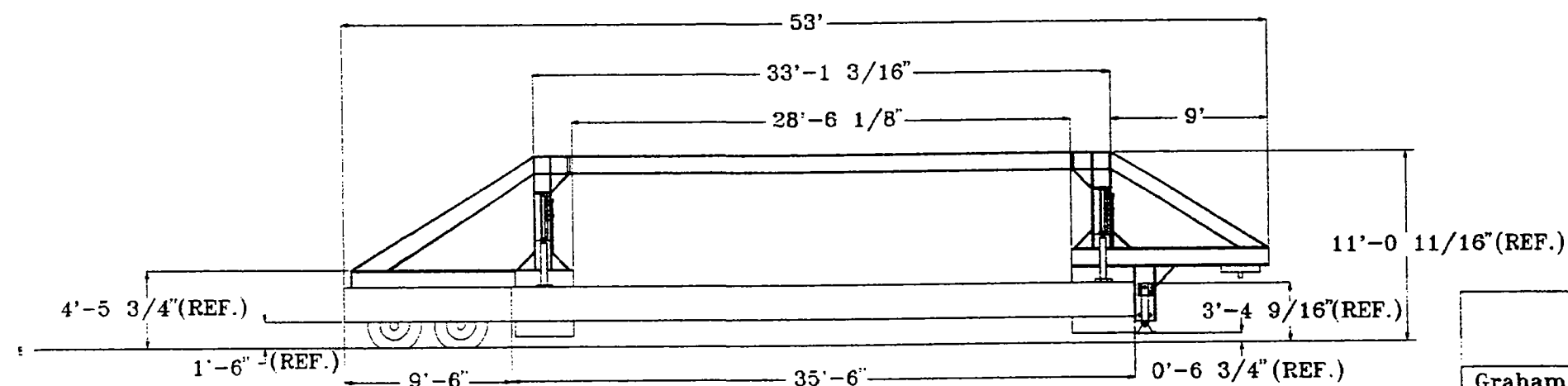
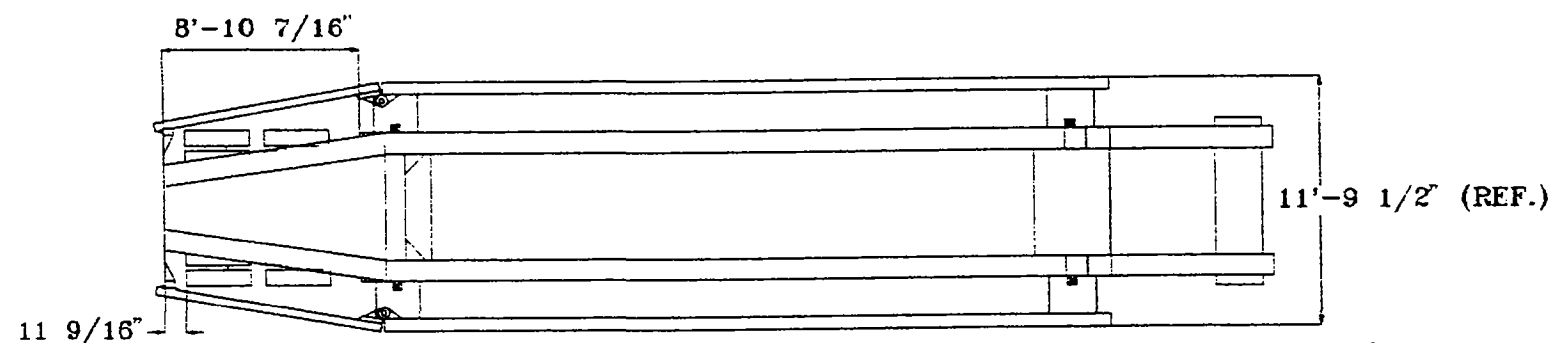
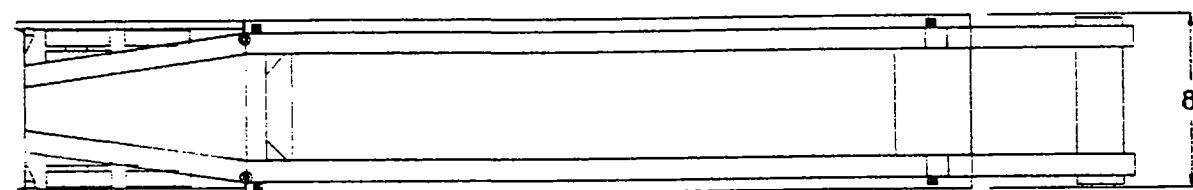
DATE: 10-20-92



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



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



STRATEGIC HIGHWAY RESEARCH PROGRAM

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



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

TITLE: PERSONNEL PROTECTION TRAILER
ASSEMBLY

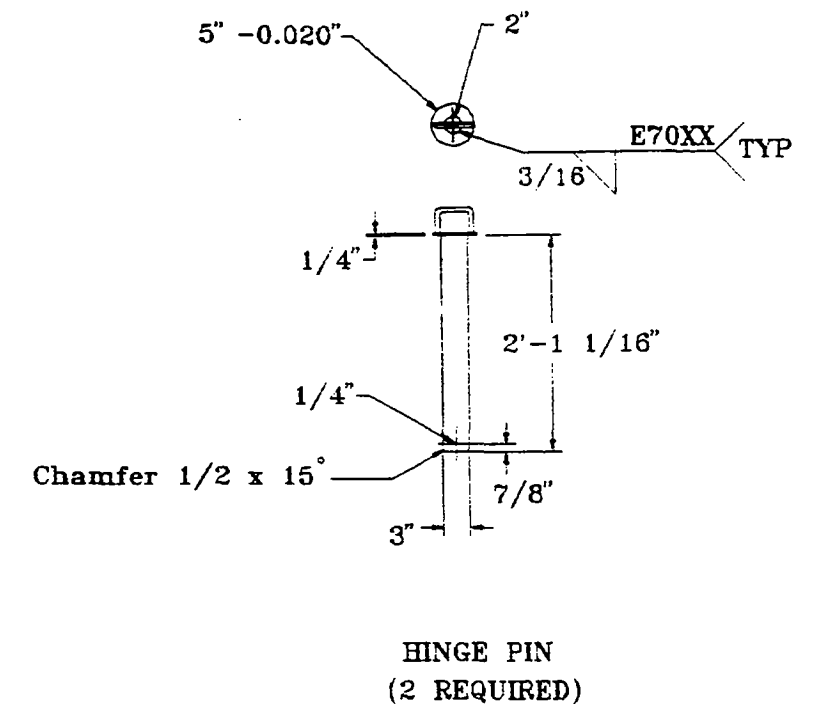
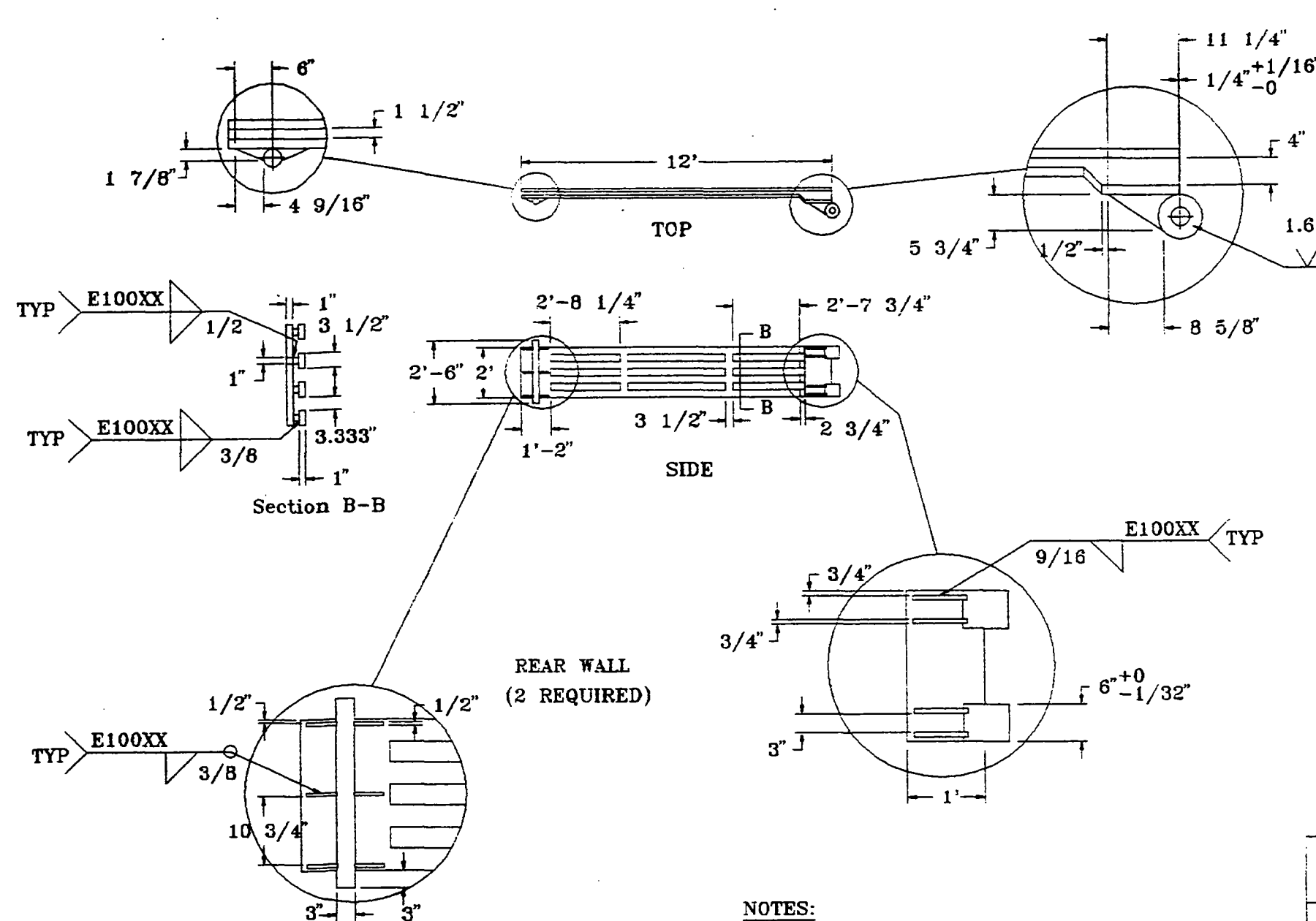
DRAWN BY: JMM
REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 1 OF 21

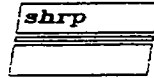

DATE: 9-14-92

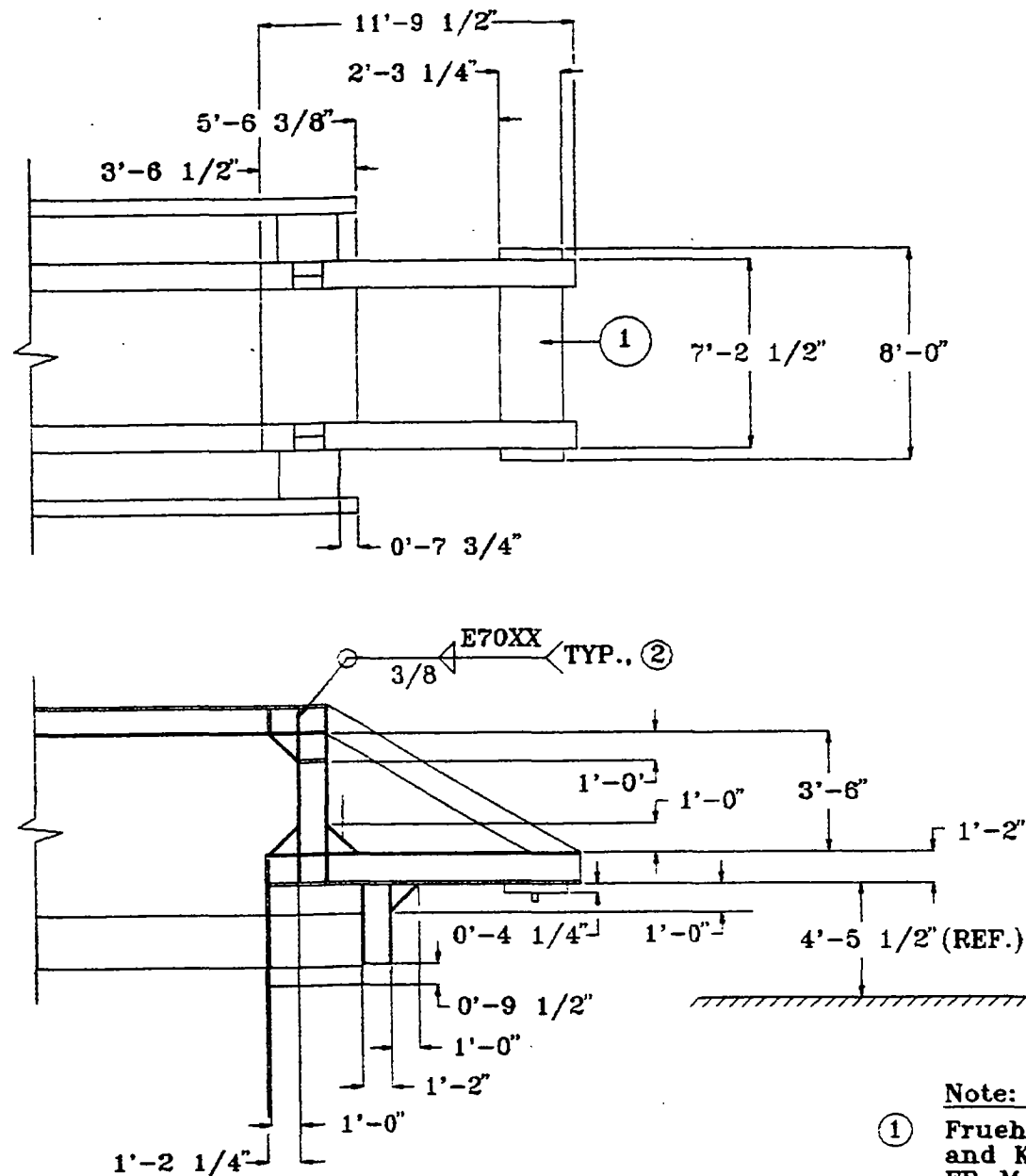


MATERIALS

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

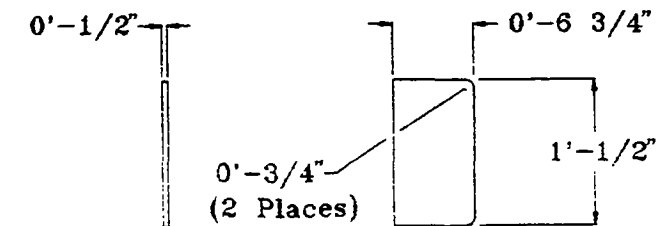
- NOTES:**
- ① USE COORDINATED 1000 ELECTRODES
 - ② PAINT ALL WALLS AND GUSSETTS WITH RUST-INHIBITIVE PRIMER. DO NOT PAINT PINS, PIN CAPS, OR HINGES.

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

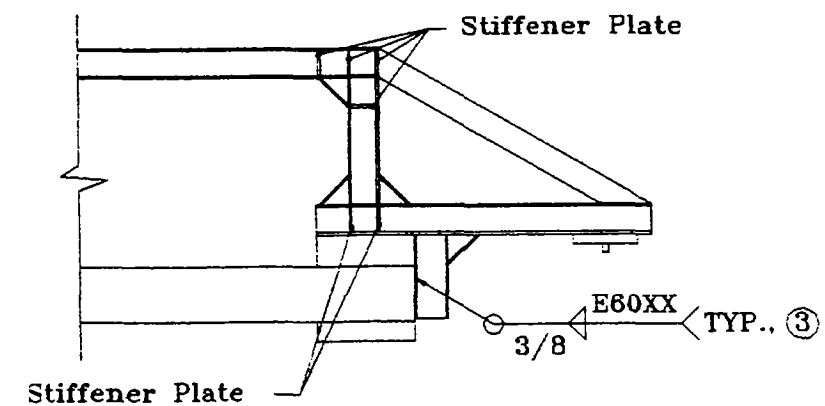


Note:

- 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)



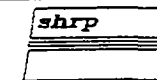
Materials:

W14 x 90 : ASTM A36

Stiffener Plates : ASTM A242 Type 2

Overhead Beams, Gooseneck Beams, Beam Stiffeners:

W14 x 90, ASTM A36



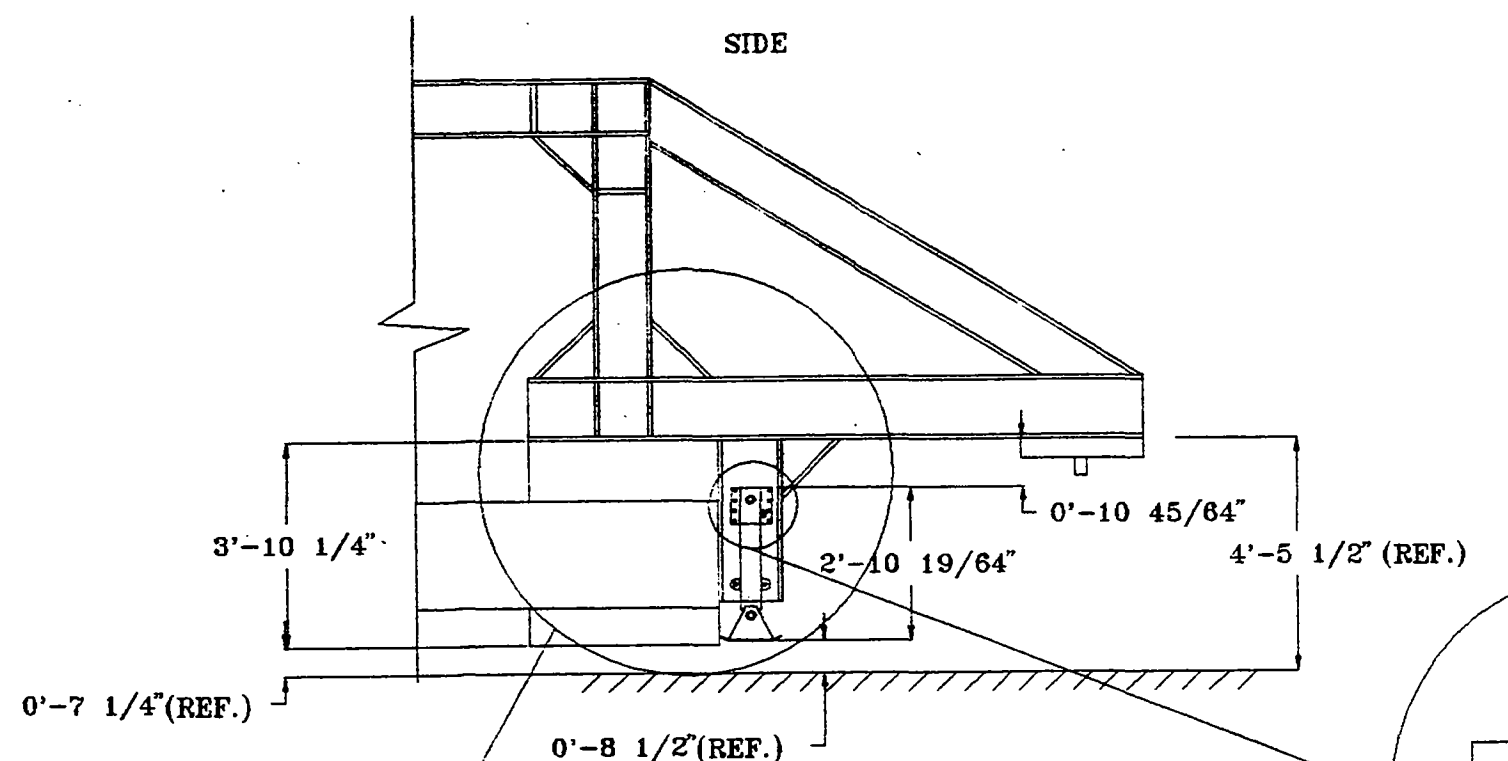
STRATEGIC HIGHWAY RESEARCH PROGRAM

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

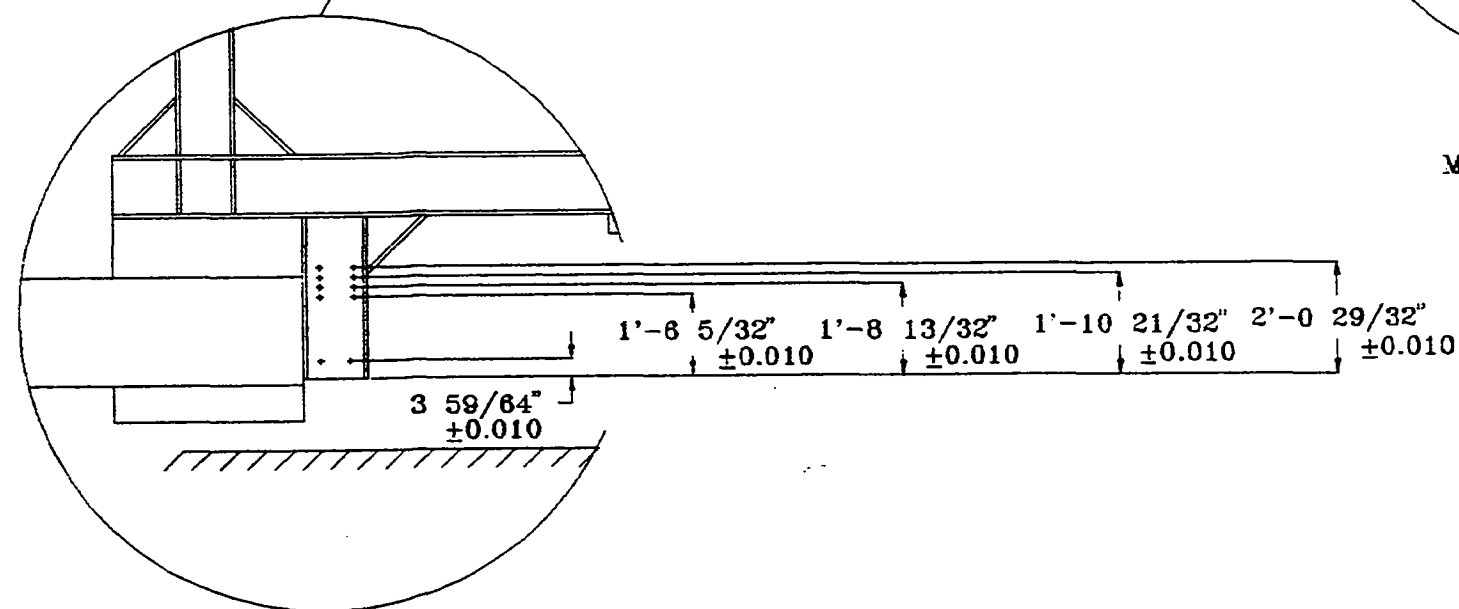


(816) 254-1788
FAX (816) 254-4654

TITLE: FRONT	DRAWN BY: JMM REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER	SCALE: NONE
DRAWING NUMBER: 4 OF 21	DATE: 9-15-92

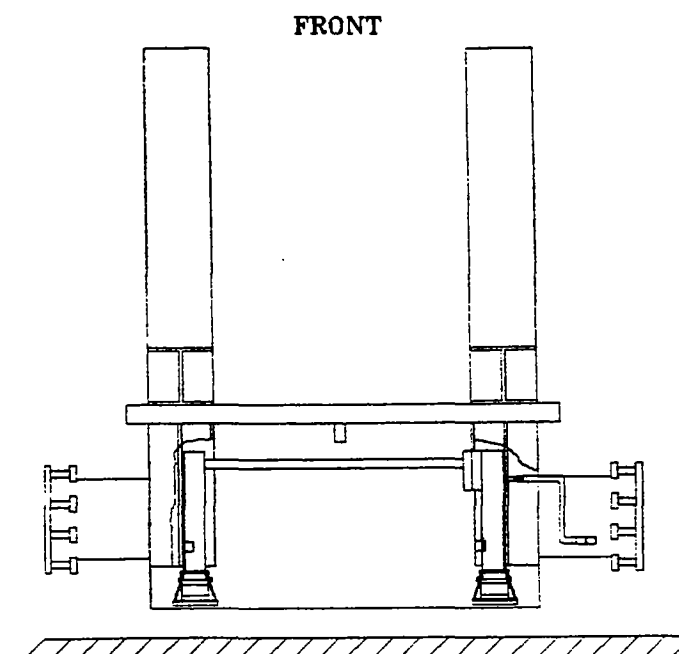


RIGHT SIDE



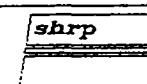
RIGHT FRONT

**LANDING GEAR
MOUNTING BRACKET**



NOTES:

- ① Binkley Landing Gear
Main & Elm Street
Warrenton, MO. 63383
(314) 456-3455
Order No. LG-4811-70
- ② 5/8-11 X 1 1/2" Heavy Hex Structural
Bolt, SAE Grade 5 Steel
- ③ 5/8-in. Regular Helical Spring
Lock Washer
- ④ 5/8-in. N, Type A Plain Washer
- ⑤ 5/8-11 Hex Jam Nut, SAE
Grade 5 Steel



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050



(816) 254-1788

FAX (816) 254-4654

TITLE:

LANDING GEAR

DRAWN BY: RLM

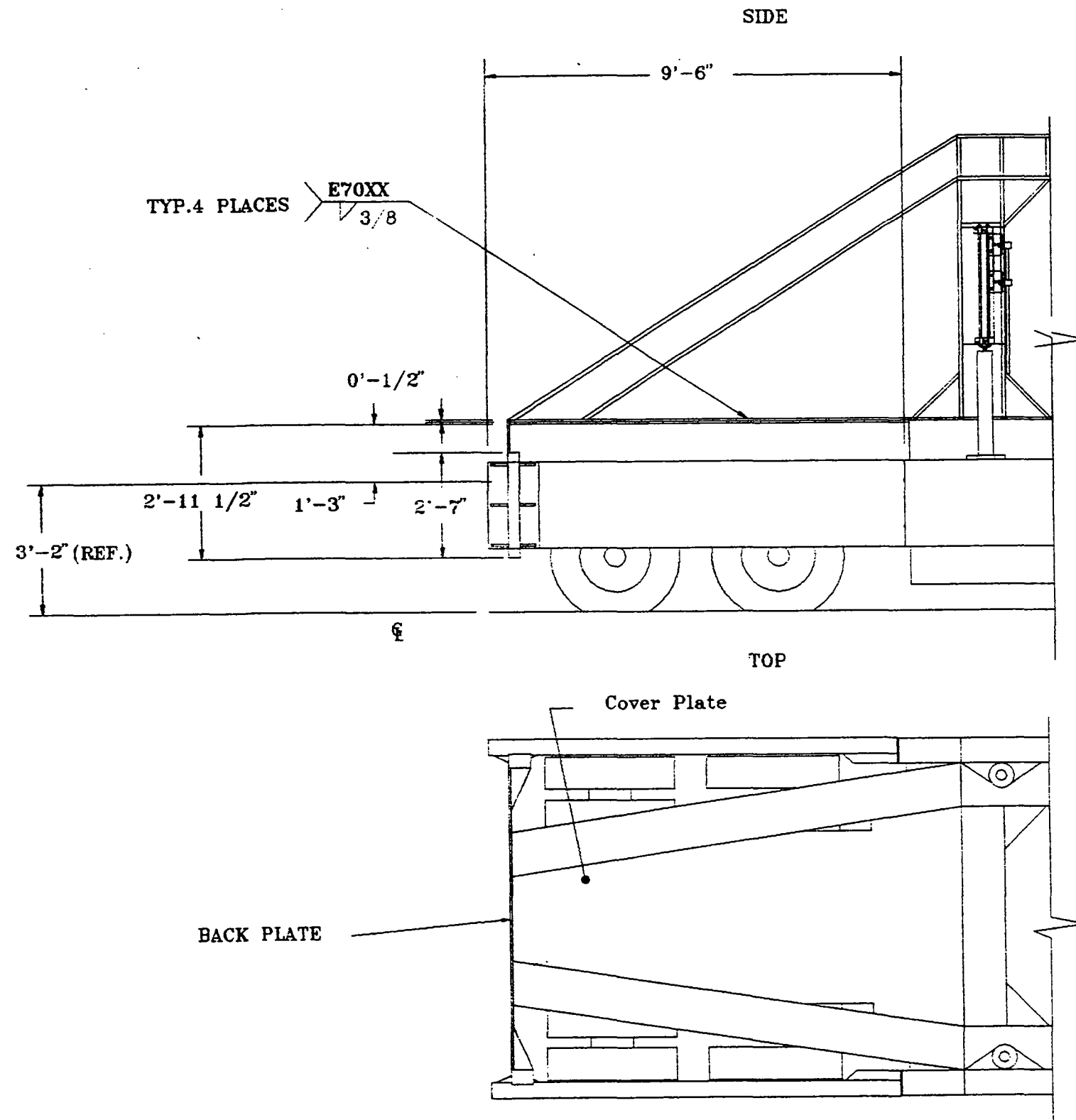
REVISED: 9-10-92



ASSEMBLY: PERSONNEL PROTECTION TRAILER

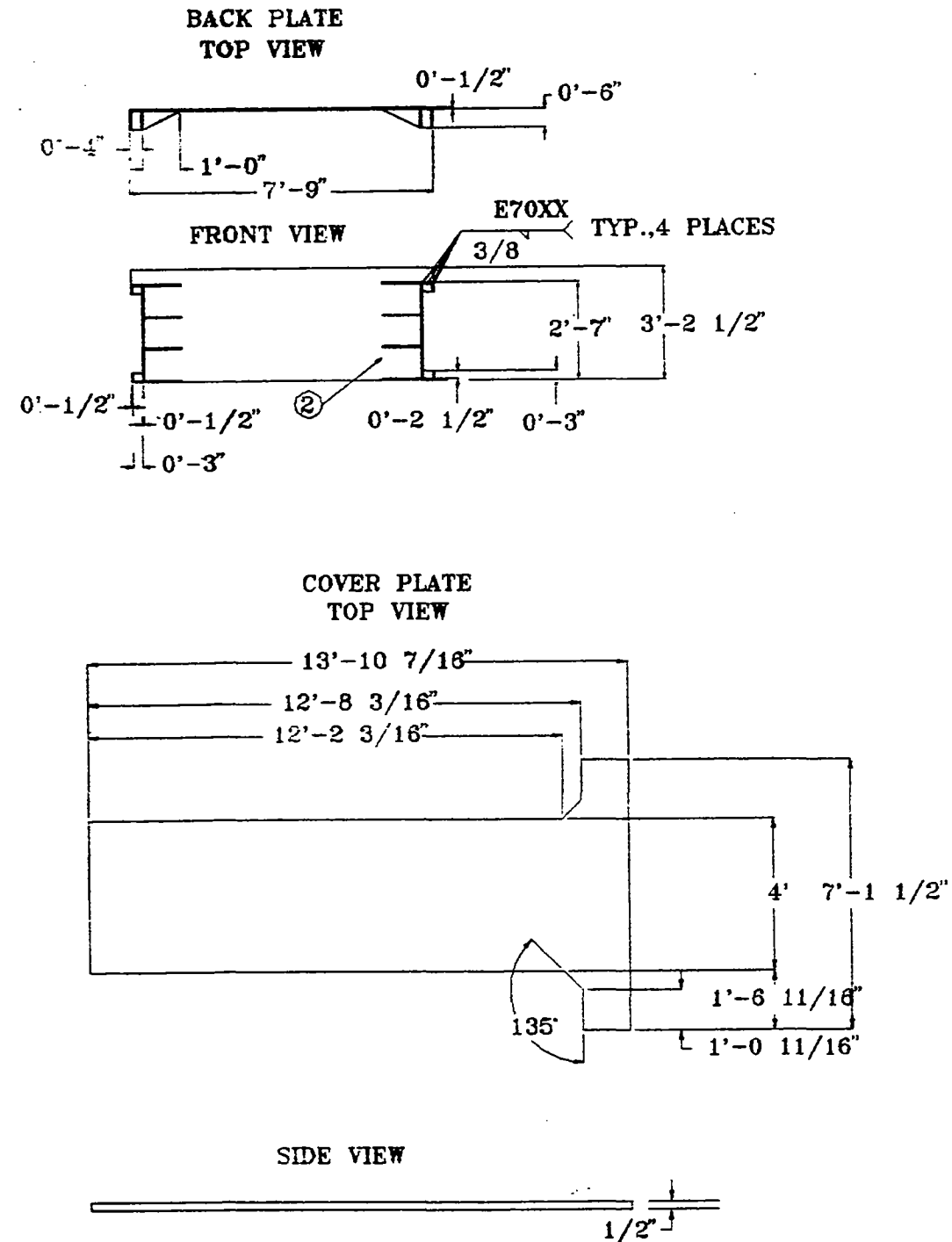
SCALE: NONE

DRAWING NUMBER: 5 OF 21

DATE: 9-10-92

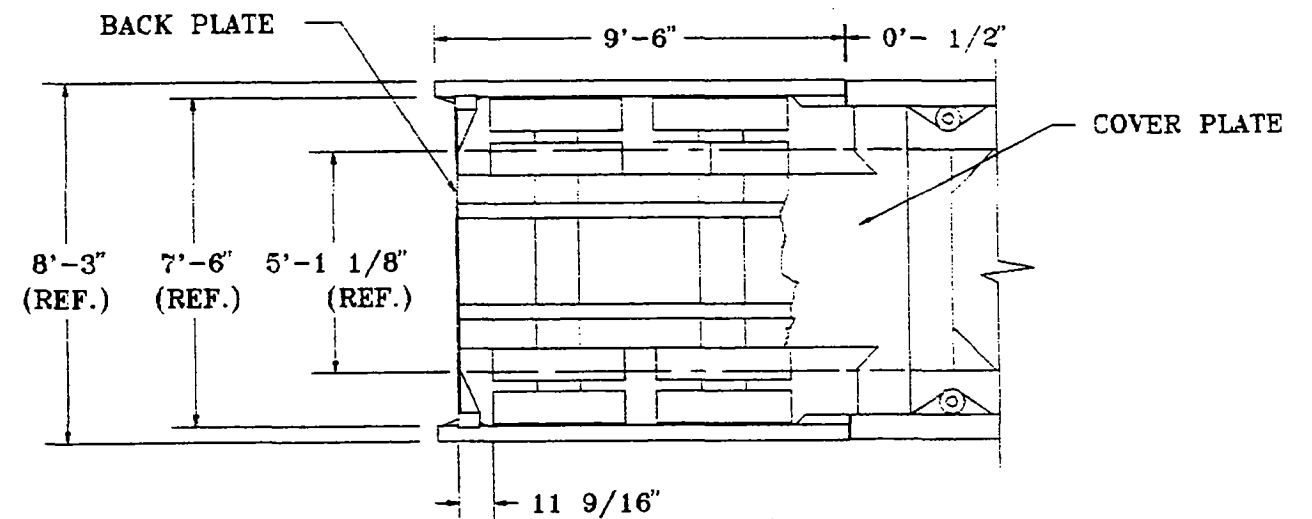


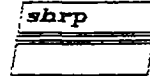

 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: REAR ASSEMBLY	DRAWN BY: JMM
	REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER	SCALE: NONE
DRAWING NUMBER: 6 OF 21	DATE: 9-14-92

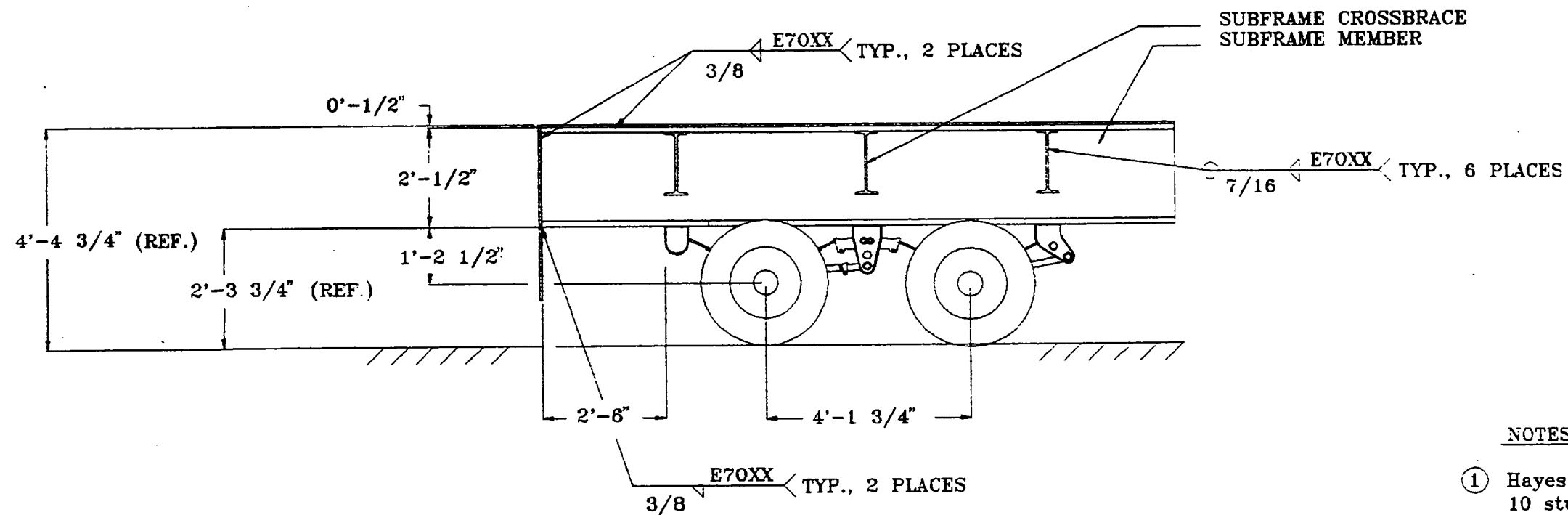


Materials:

Cover Plate: 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:	BACK PLATE AND COVER PLATE
ASSEMBLY:	REAR
DRAWING NUMBER:	7 OF 21
DRAWN BY:	JMM
REVISED:	RLM
SCALE:	NONE
DATE:	9-14-92

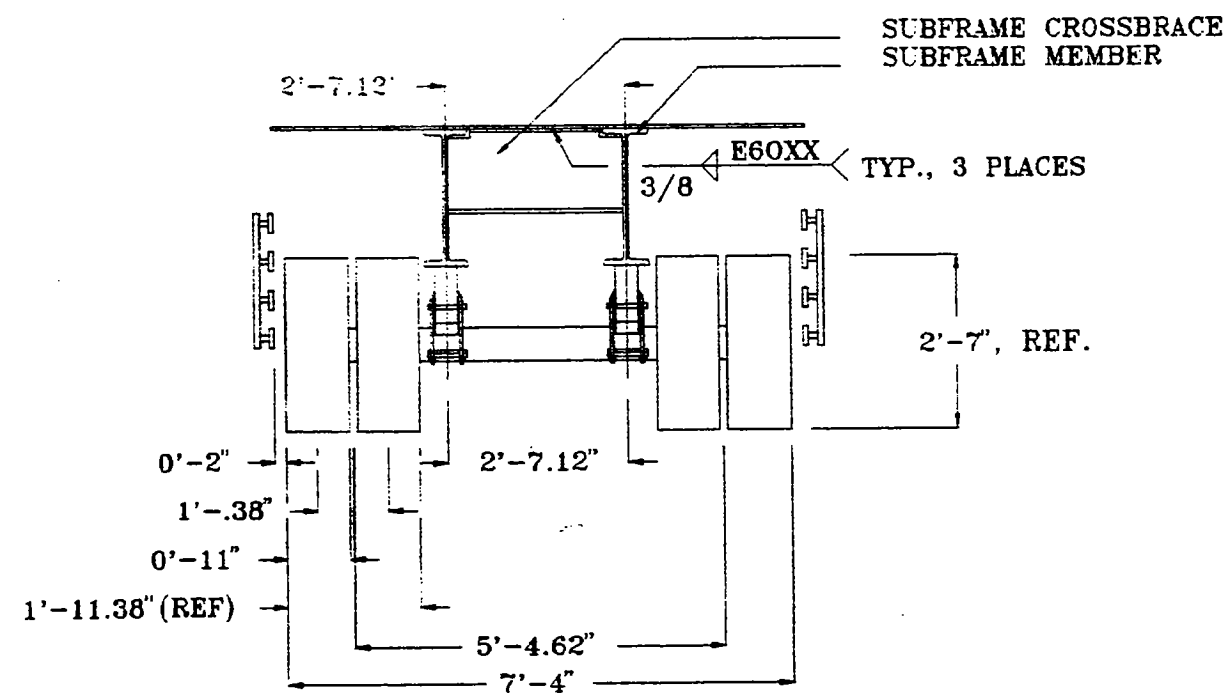



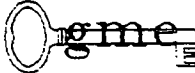
NOTES:

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

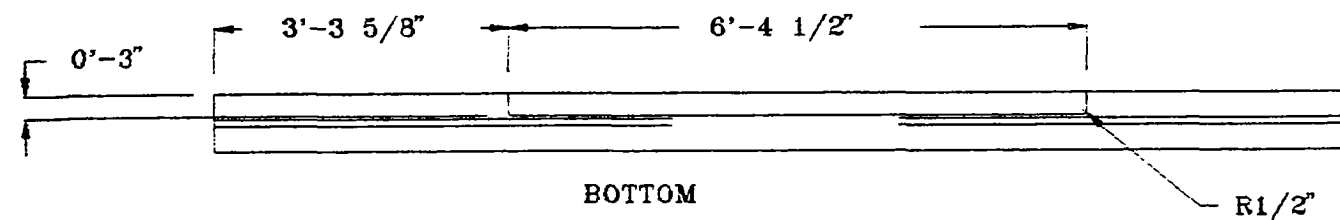
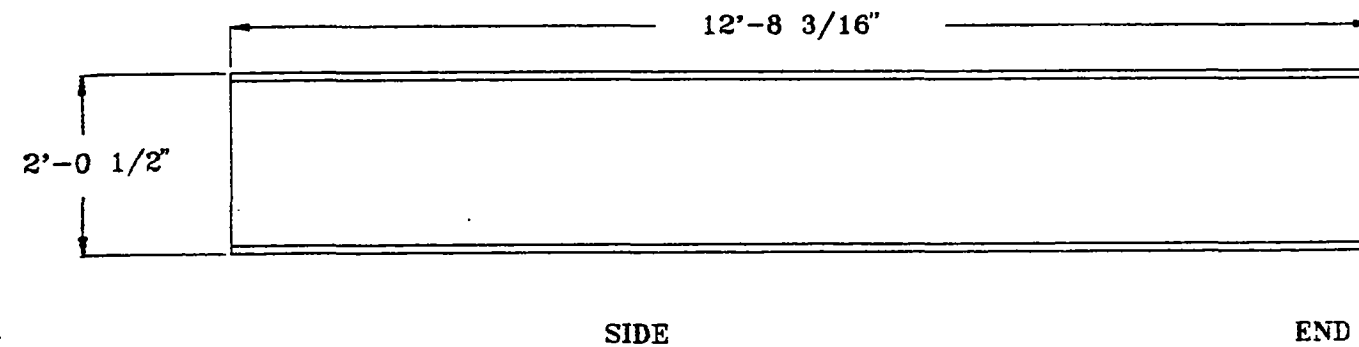
Hayes Axle, Inc.
307 A St.
Seminole, OK. 74868
800-922-9030

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



 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
SUBFRAME ASSEMBLY	REVISED: RLM
ASSEMBLY: PERSONNEL PROTECTION TRAILER	SCALE: NONE
DRAWING NUMBER: 8 OF 21	DATE: 9-15-92

SUBFRAME MEMBERS
(2 REQUIRED)

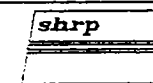
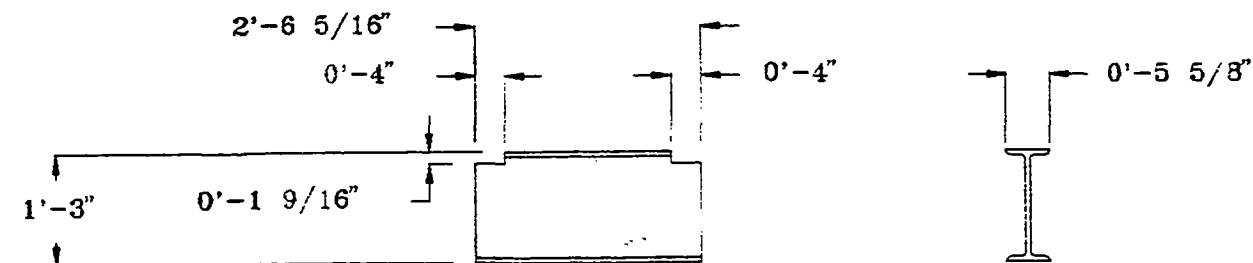


MATERIALS:

SUBFRAME : S24 X 121, ASTM A36

SUBFRAME CROSS BRACE : S15 X 50, ASTM A36

SUBFRAME CROSS BRACE
(3 REQUIRED)



STRATEGIC HIGHWAY RESEARCH PROGRAM

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



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

TITLE: SUBFRAME MEMBERS
AND SUBFRAME CROSS BRACES

DRAWN BY: JMM

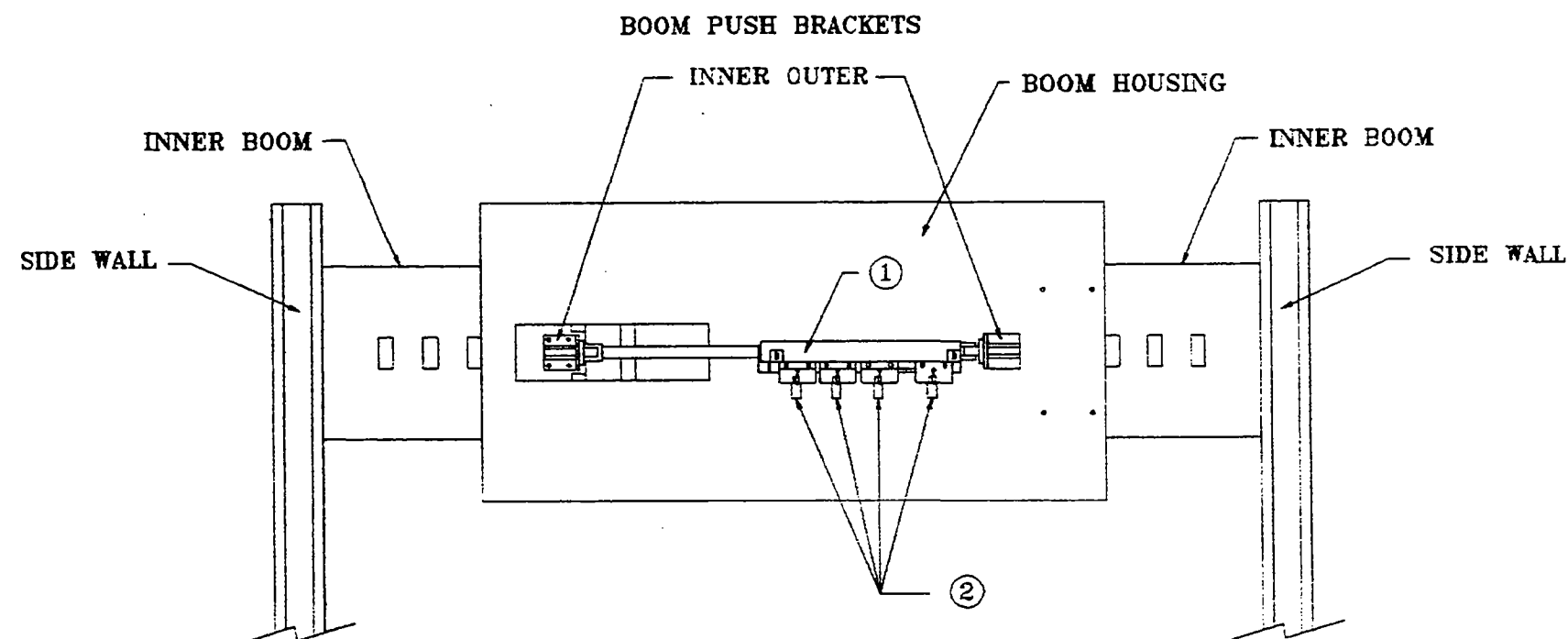
REVISED: RLM

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

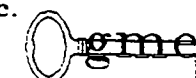
Materials

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

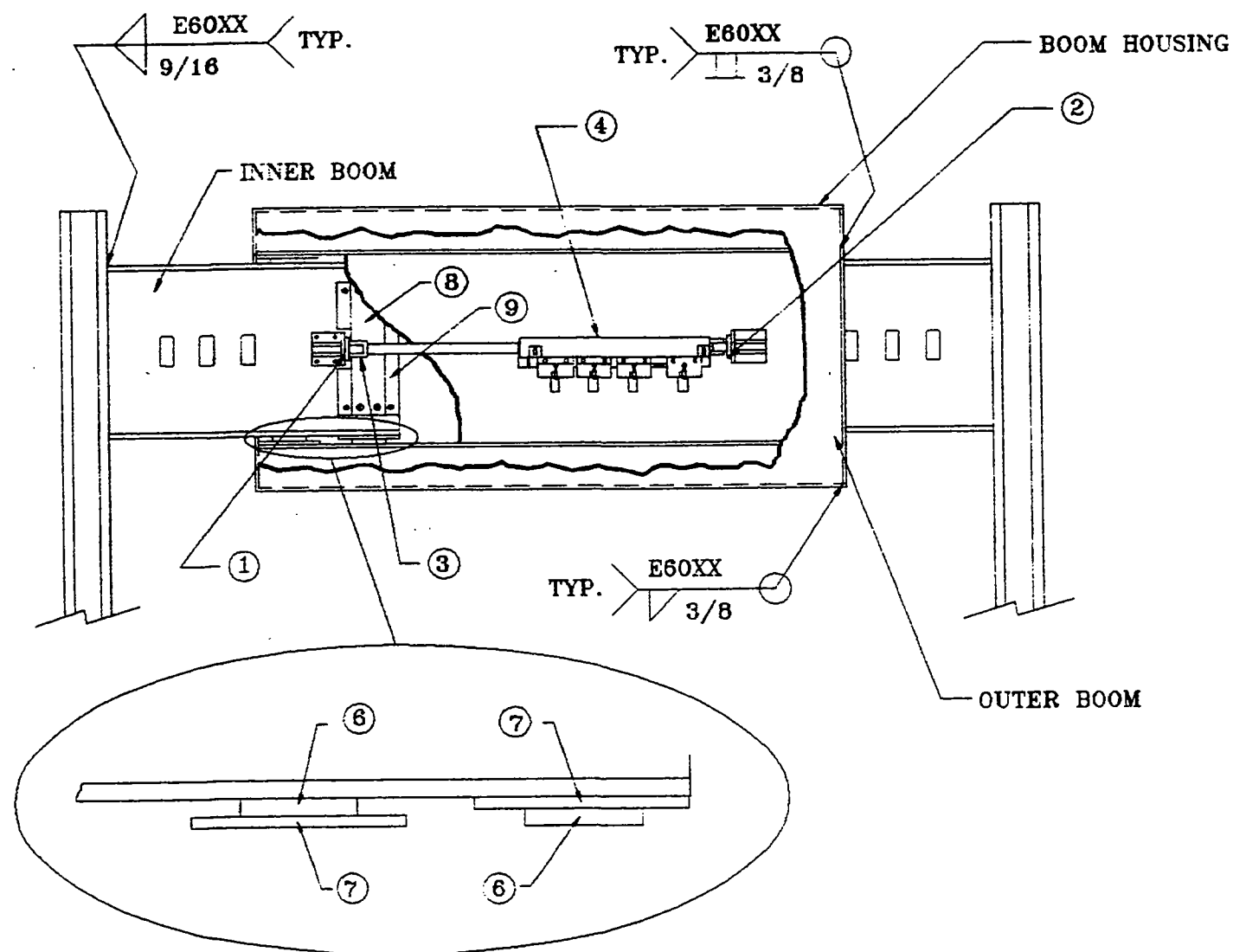
REVISED: 10-26-92

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



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
 CUTAWAY VIEW

DRAWN BY: RLM

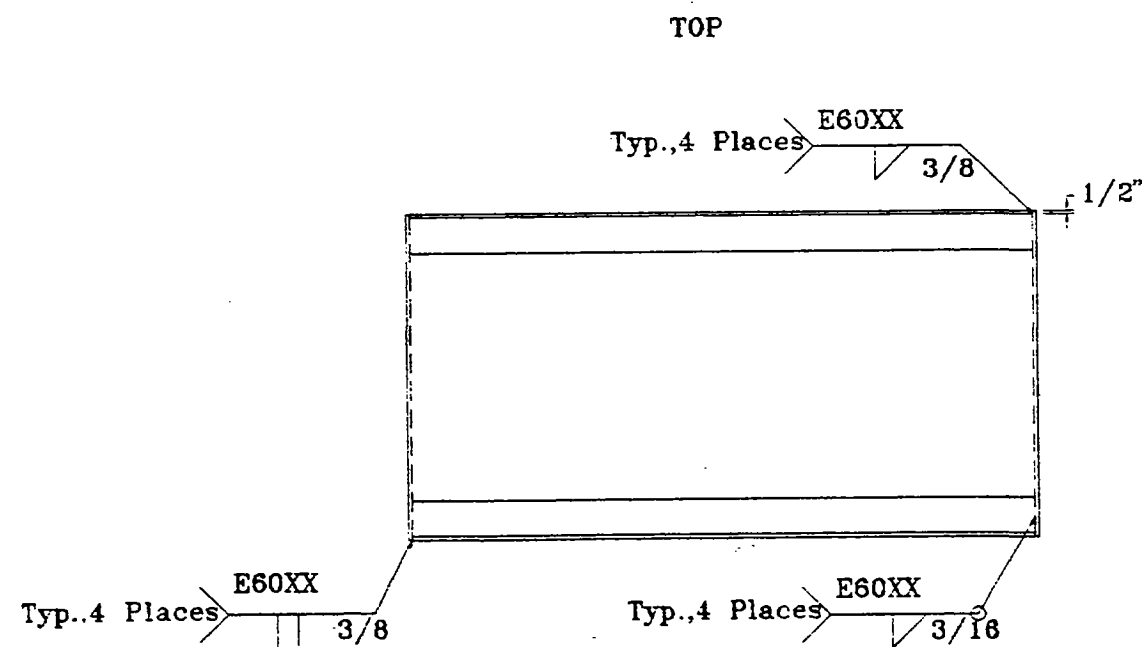
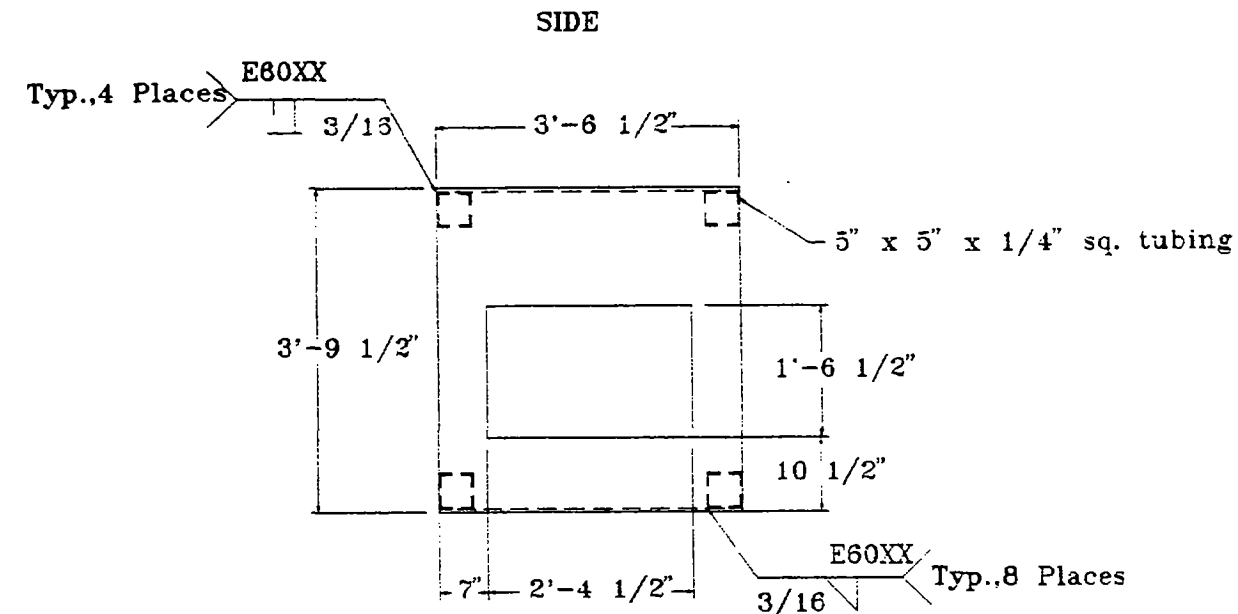
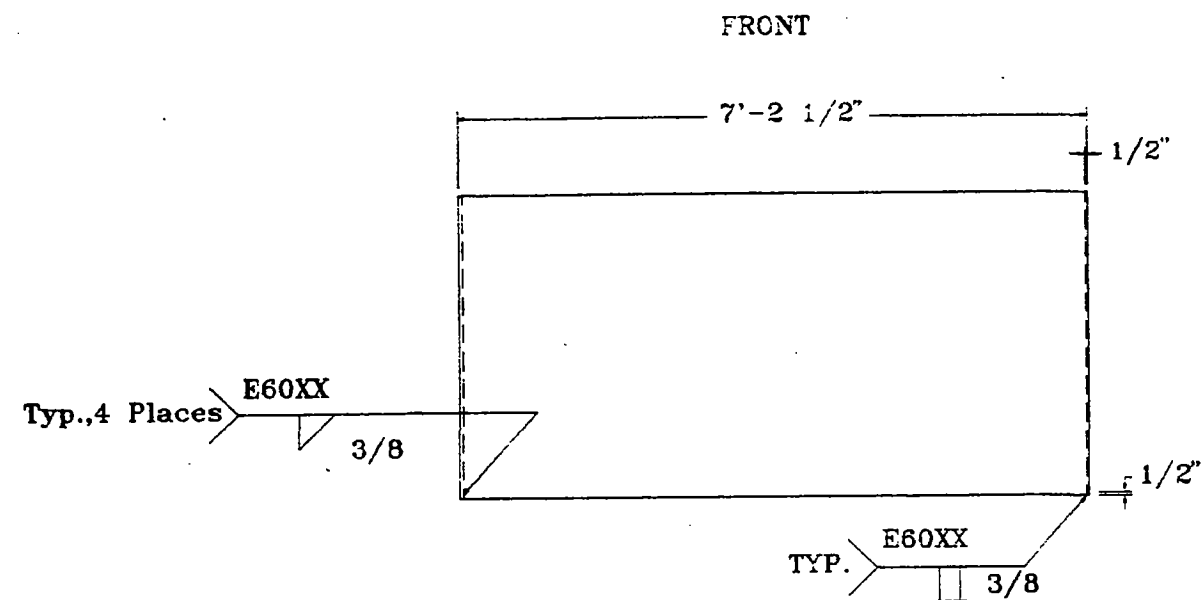
REVISED: 10-26-92

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 11 OF 21

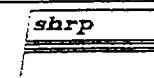
DATE: 10-26-92



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.



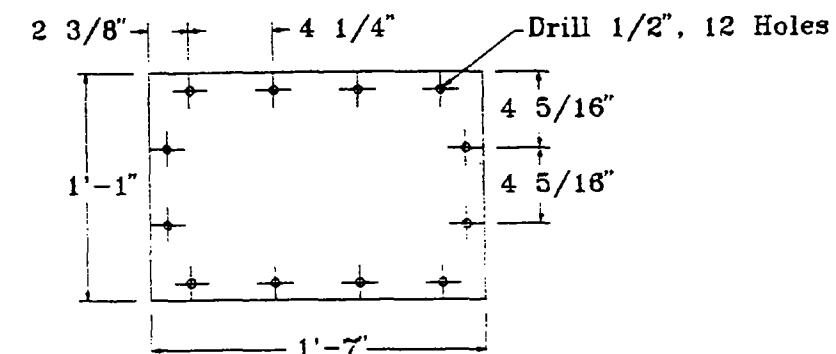
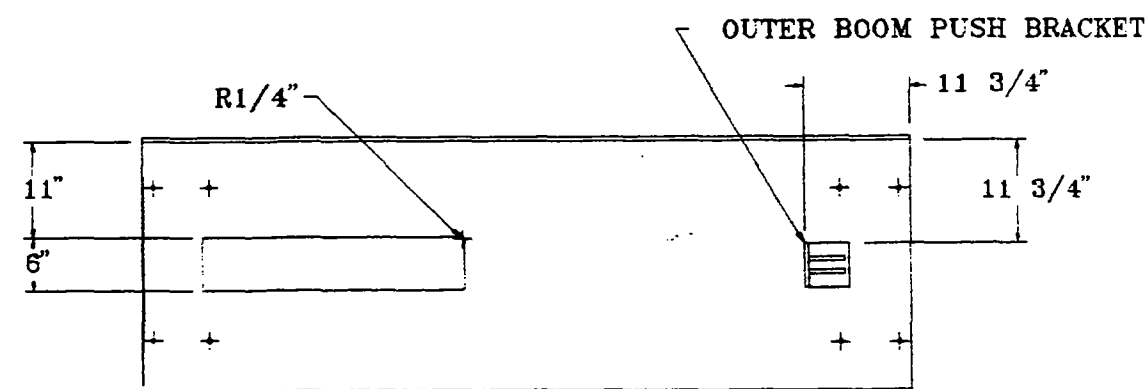
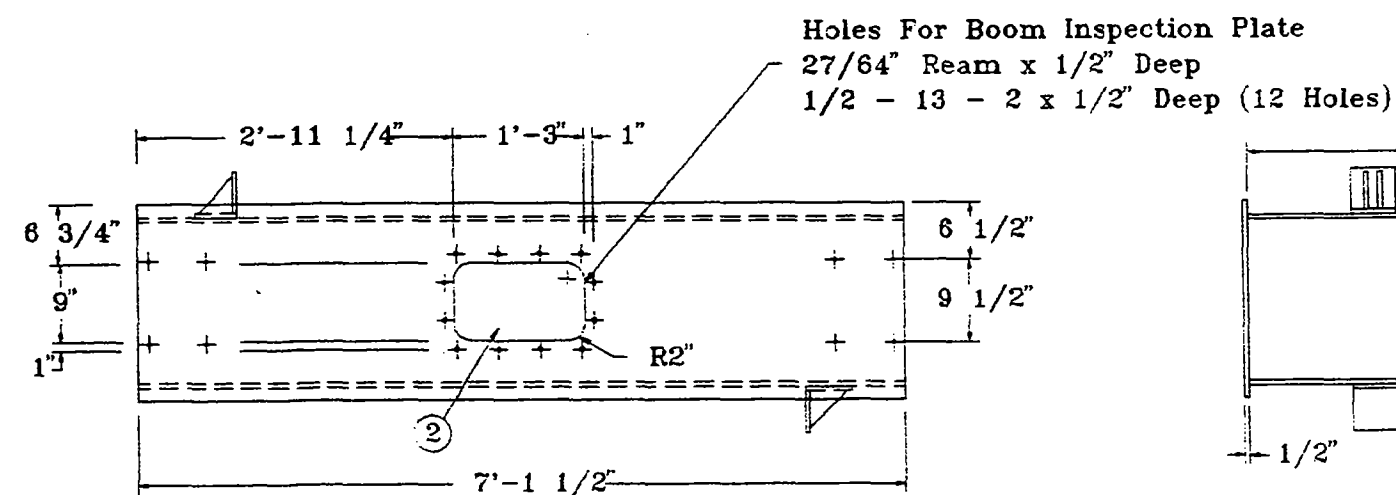
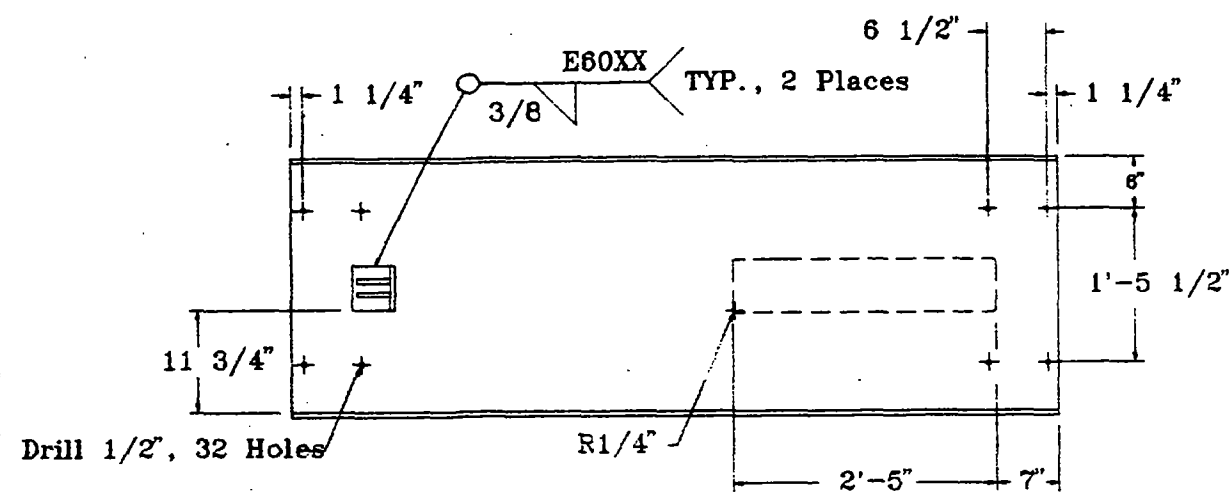
STRATEGIC HIGHWAY RESEARCH PROGRAM

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

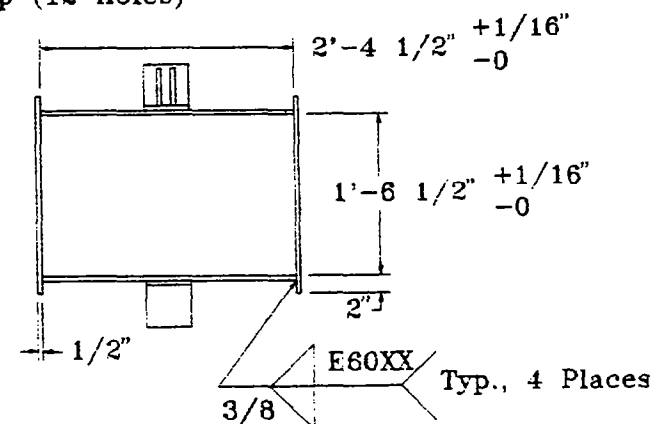


(816) 254-1788
FAX (816) 254-4654

TITLE: BOOM HOUSING		DRAWN BY: RLM
ASSEMBLY: BOOM		REVISED: 9-9-92
DRAWING NUMBER: 12 OF 21		SCALE: NONE
		DATE: 9-9-92


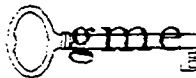


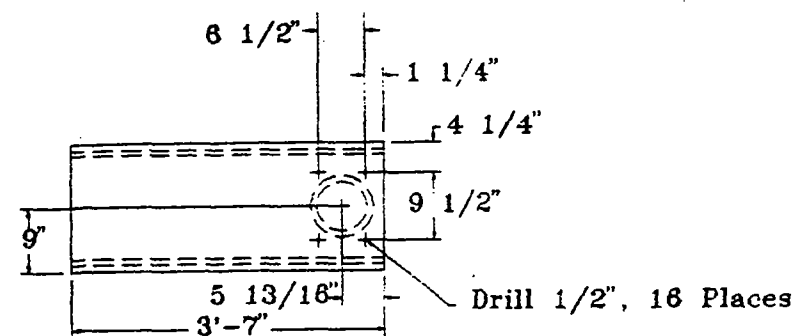
OUTER BOOM INSPECTION PLATE
(4 REQUIRED)
PLATE THICKNESS=1/4"



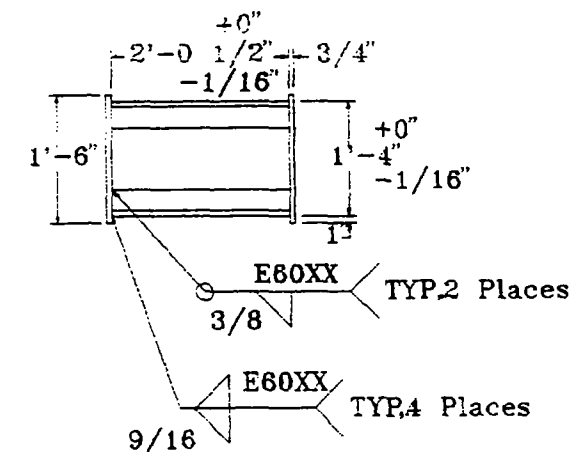
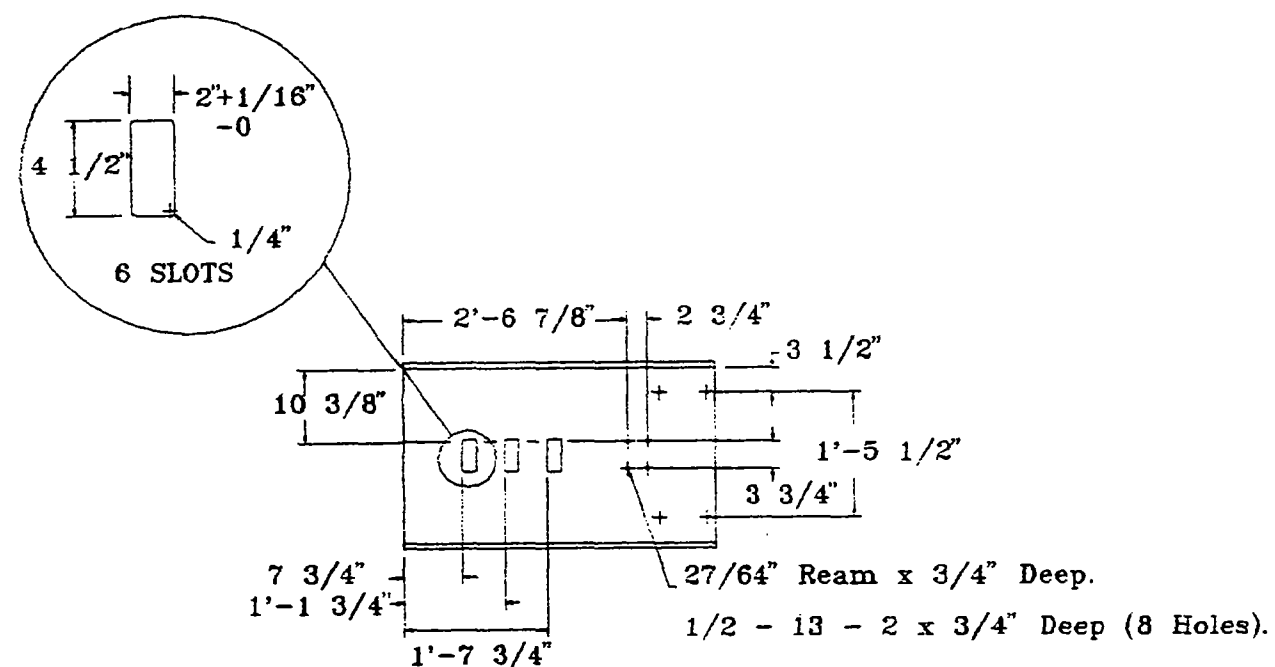
Note:

- 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:	OUTER BOOM AND OUTER BOOM INSPECTION PLATE
ASSEMBLY:	BOOM
DRAWING NUMBER:	13 OF 21
DRAWN BY:	RLM
REVISED:	9-9-92
SCALE:	NONE
DATE:	9-9-92

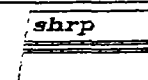


INNER BOOM (4 REQUIRED)



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

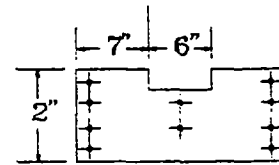
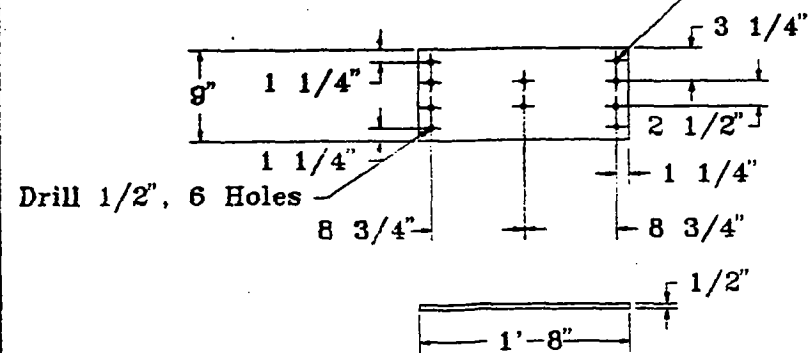


(816) 254-1788
FAX (816) 254-4654

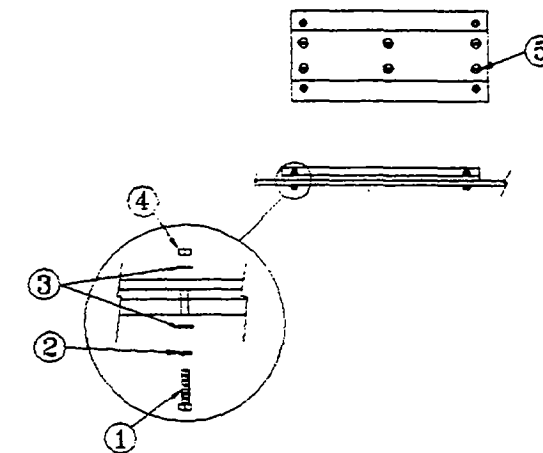
TITLE:	INNER BOOM	DRAWN BY: RLM
ASSEMBLY:	BOOM	REVISED: 9-9-92
DRAWING NUMBER:	14 OF 21	SCALE: NONE
		DATE: 9-9-92

TOP/BOTTOM PAD PLATES
(12 REQUIRED)

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

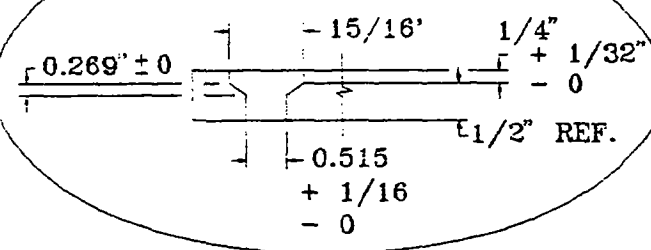
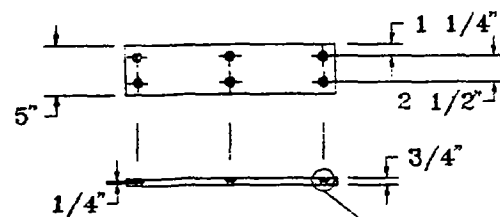


ASSEMBLY OF BOOM
PADS AND PLATES

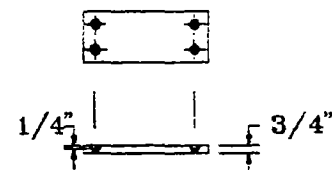
NOTES:

- 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)

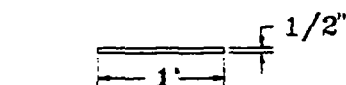
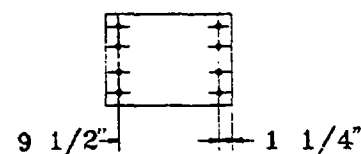


SIDE BOOM PADS
(16 REQUIRED)



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



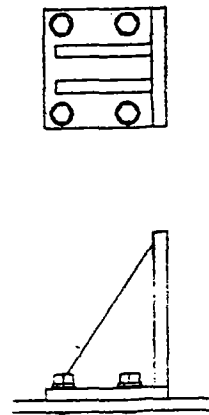
STRATEGIC HIGHWAY RESEARCH PROGRAM

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

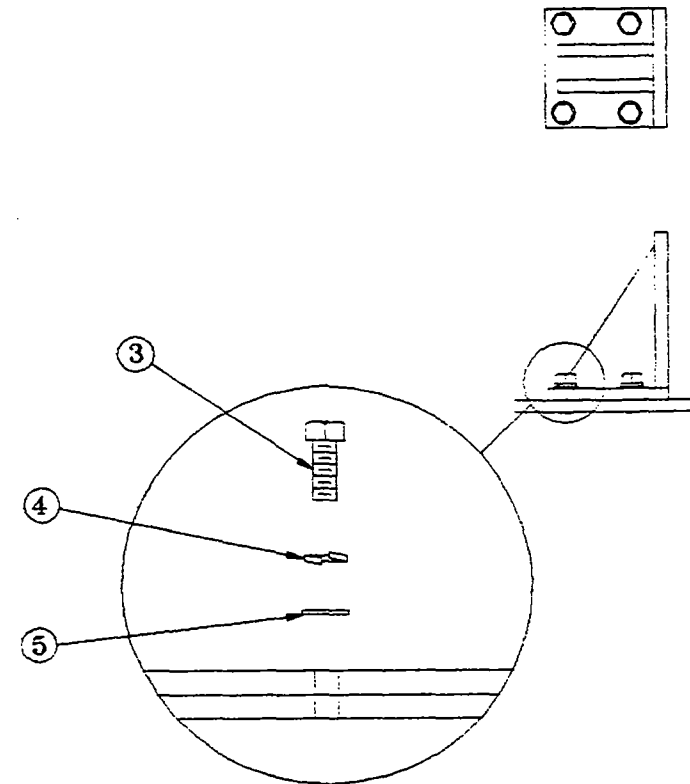
(816) 254-1788
FAX (816) 254-4654

TITLE:	BOOM PADS & PLATES	DRAWN BY: RLM
ASSEMBLY:	BOOM	REVISED: 9-2-92
DRAWING NUMBER:	15 OF 21	SCALE: NONE
		DATE: 9-2-92

Outer Boom Push Bracket

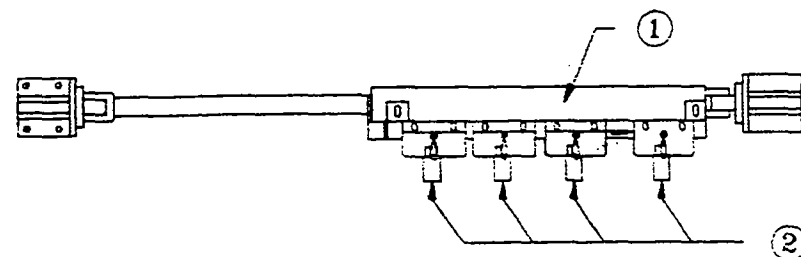


Inner Boom Push Bracket



Assembly of Inner Boom Push Bracket and Inner Boom

Boom Cylinder



NOTES:

- 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 ILS1
Electric Switches, Inc.
2478 Fletcher Dr.
Los Angeles, 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.



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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
REVISED: 9-2-92

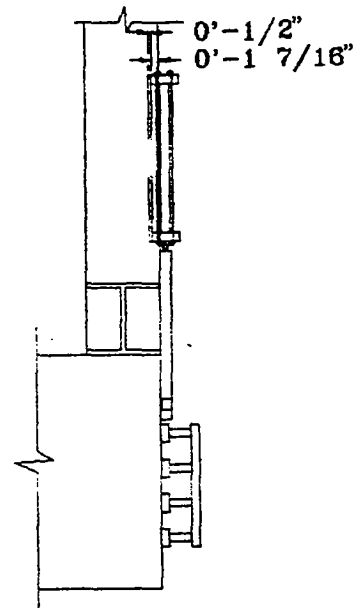
ASSEMBLY: BOOM

SCALE: NONE

DRAWING NUMBER: 16 OF 21

DATE: 9-2-92

LEFT FRONT BOOM LOCK ASSEMBLY



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

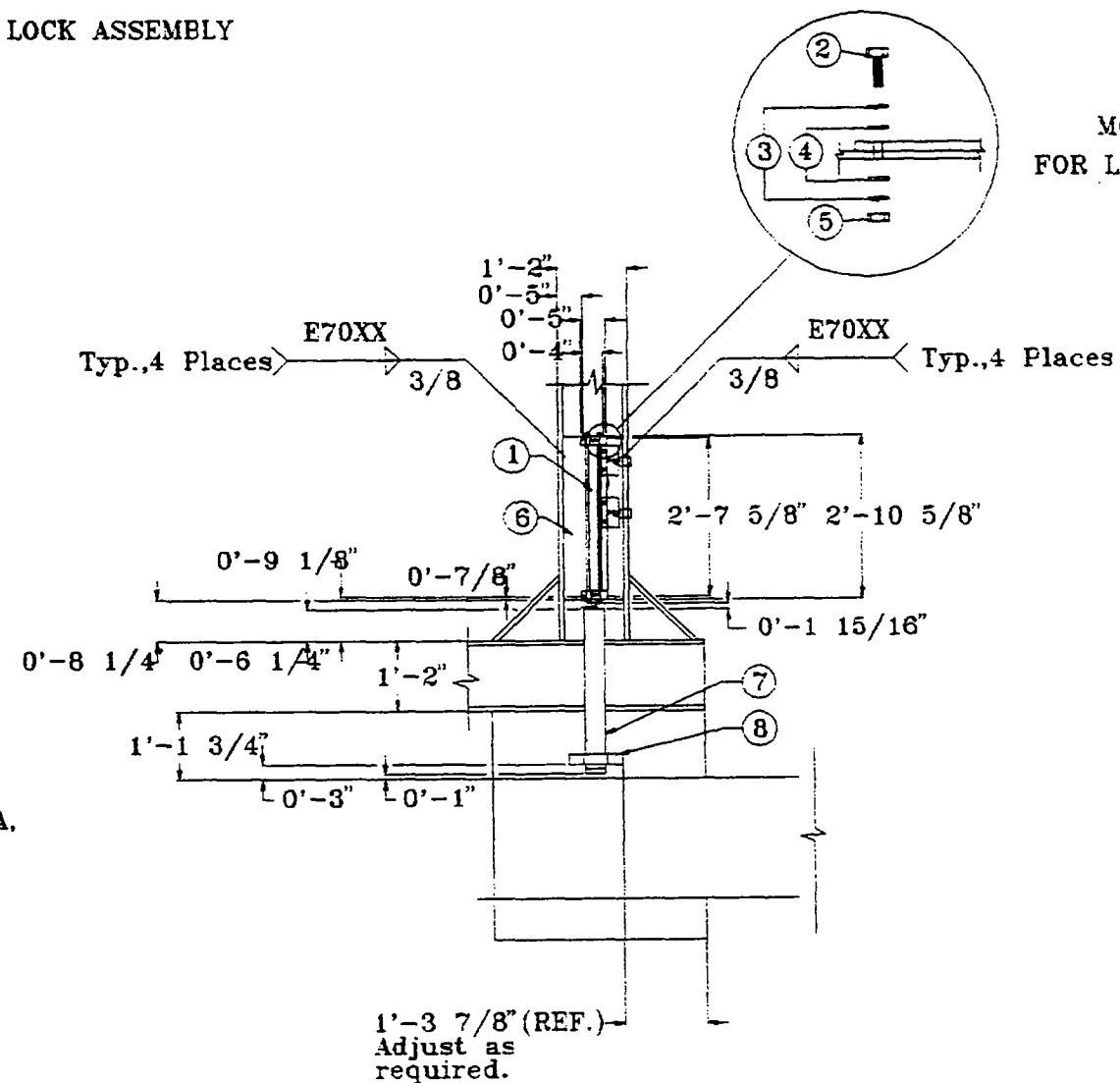
Notes:

- 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

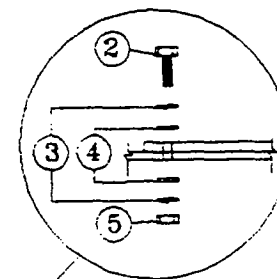
Materials:

Locking Bolts: Rytense 44, 1144, Cold Drawn.

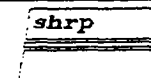
Locking Cylinder Mounting Plates: ASTM A242 Type 2.



LEFT FRONT



MOUNT DETAIL
FOR LOCKING CYLINDERS



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 ASSEMBLY

DRAWN BY: RLM

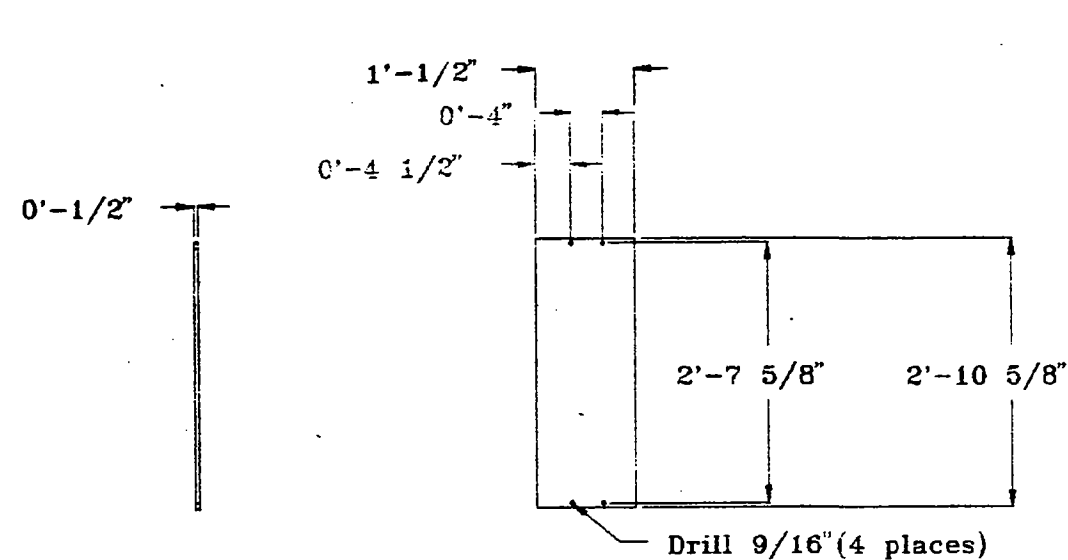
REVISED: 9-9-92

ASSEMBLY: BOOM

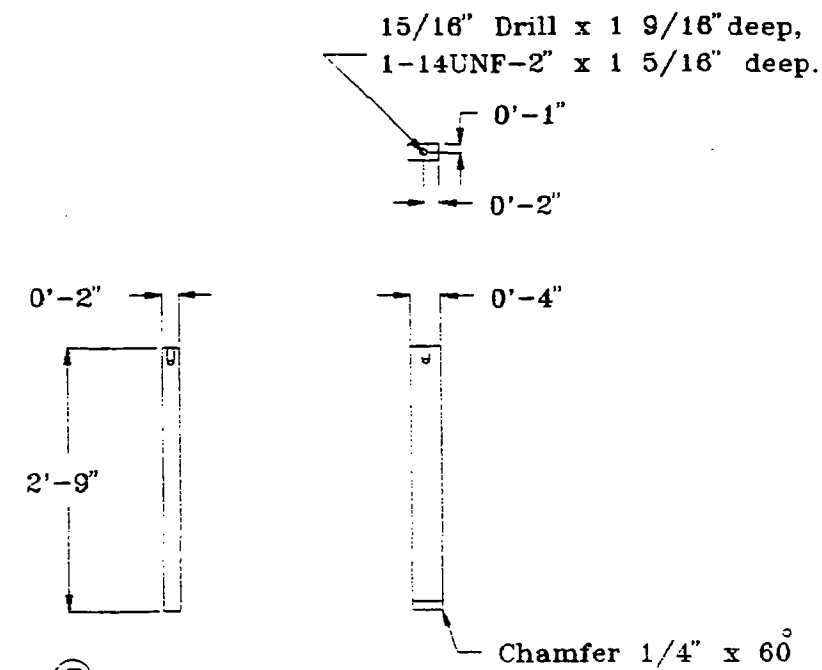
SCALE: NONE

DRAWING NUMBER: 17 OF 21

DATE: 9-9-92





Ⓐ Lock Cylinder Mounting Plate
(4 Required)

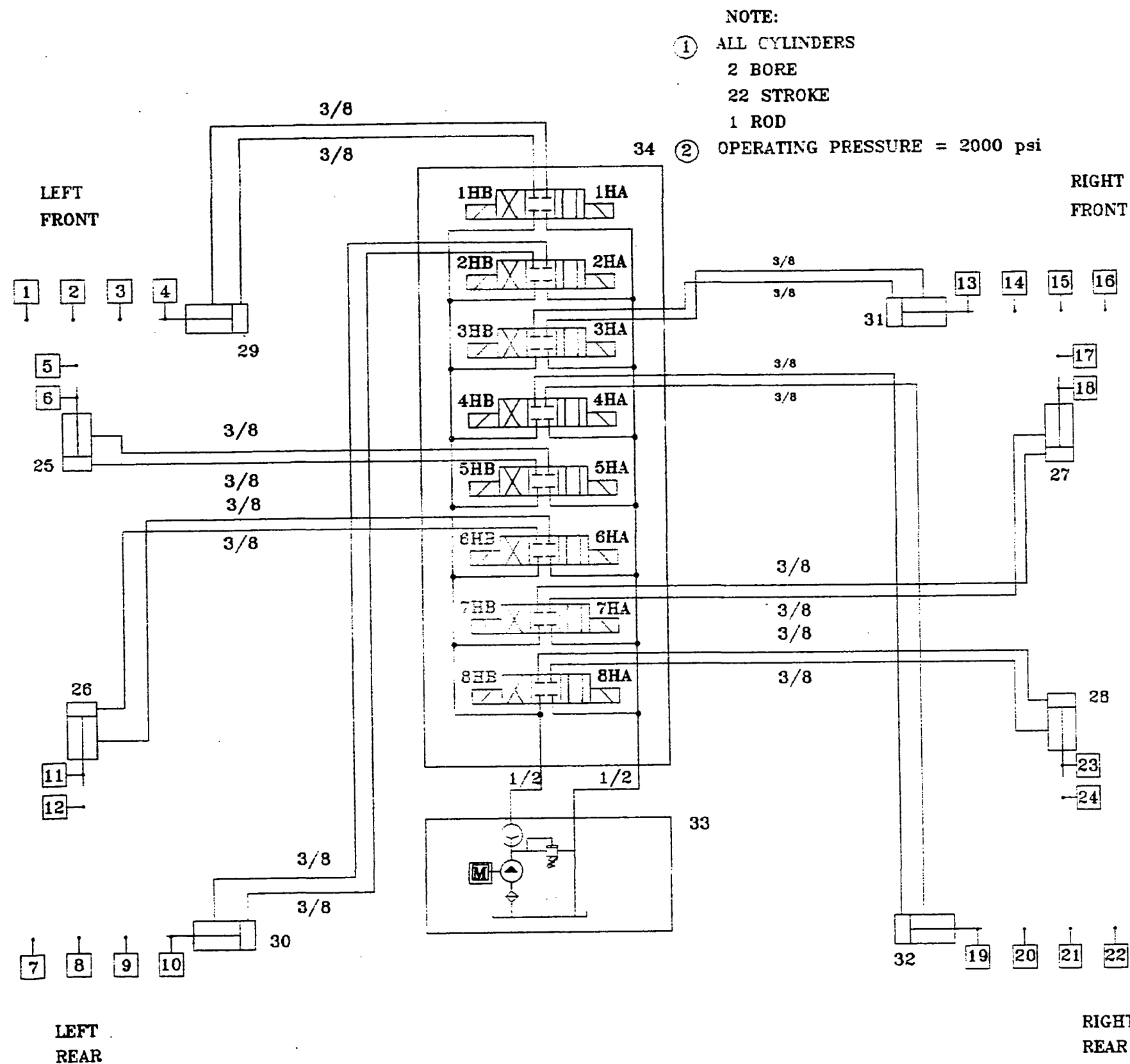


Ⓑ Locking Bolt
(4 required)



Ⓒ Locking Bolt Guide
(4 Required)

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



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 PARALLEL 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.
P.O. Box 348
Independence, Missouri 64050



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

TITLE:	HYDRAULIC CIRCUIT	DRAWN BY: JMM
ASSEMBLY:	PERSONNEL PROTECTION TRAILER	REVISED: RLM
DRAWING NUMBER:	19 OF 21	SCALE: NONE
		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

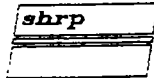
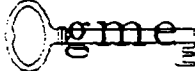
- 1HA energized, extending cylinder B, tripping limit switch LS3, LS2, LS1. 2HA energized, extending cylinder D, tripping limit switch LS9 or LS8 or LS7. 3HA energized, extending cylinder F, tripping limit switch LS14 or LS15 or LS16. 4HA energized, extending cylinder H, tripping limit switch LS20 or LS21 or LS22.
- 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, extending cylinder G.
- 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

- 5HB energizes, retracting cylinder A, tripping limit switch LS6. 6HB energized, retracting cylinder C, tripping limit switch LS11. 7HB energized, retracting cylinder E, tripping limit switch LS18. 8HB energized, retracting cylinder G, tripping limit switch LS25.
- 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.
- 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.		(816) 254-1788	
P.O. Box 348			
Independence, Missouri 64050		FAX (816) 254-4654	
TITLE: HYDRAULIC CIRCUIT		DRAWN BY: JMM	
SEQUENCE OF OPERATION		REVISED: RLM	
ASSEMBLY: PERSONNEL PROTECTION TRAILER		SCALE: NONE	
DRAWING NUMBER: 20 OF 21		DATE: 9-10-92	

							SOLENOIDS															
							1HA	1HB	2HA	2HB	3HA	3HB	4HA	4HB	5HA	5HB	6HA	6HB	7HA	7HB	8HA	8HB
SEQ.	OPERATION	CYCLE TIME (S)																				
		10	20	30	40	50																
AUTOMATIC EXTEND (10 FT.)																						
1	WALL OUT	9.2					+	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-
2	LOCK		20.8				-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-
AUTOMATIC RETRACT (10 FT.)																						
1	UNLOCK	15.5					-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	+
2	WALL IN		8.9				-	+	-	+	-	+	-	+	-	-	-	-	-	-	-	-
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

-



STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050



(816) 254-1788

FAX (816) 254-4554

TITLE: HYDRAULIC CIRCUIT
LOGIC TABLE

DRAWN BY: RLM

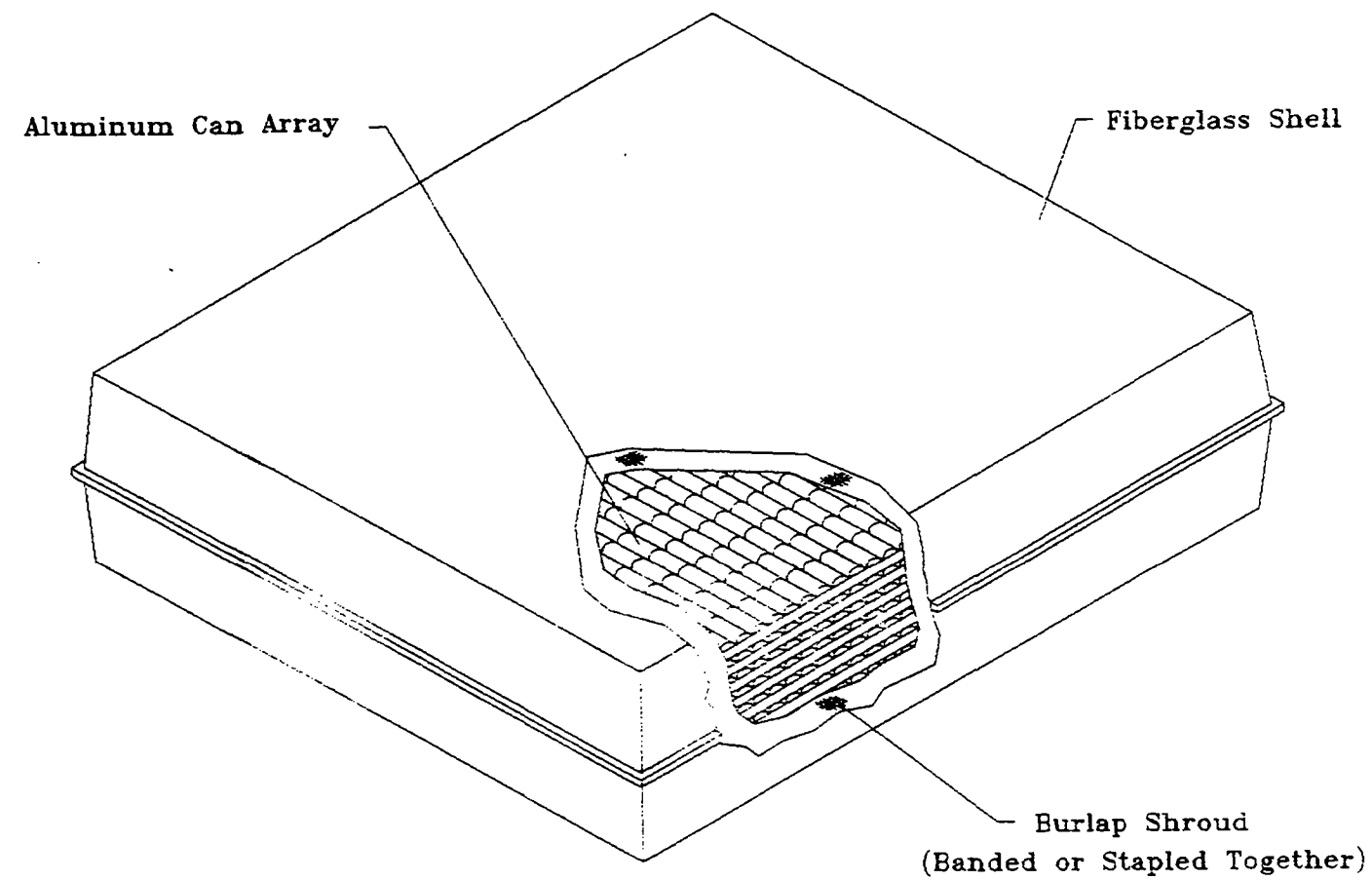
REVISED: 9-10-92



ASSEMBLY: PERSONNEL PROTECTION TRAILER

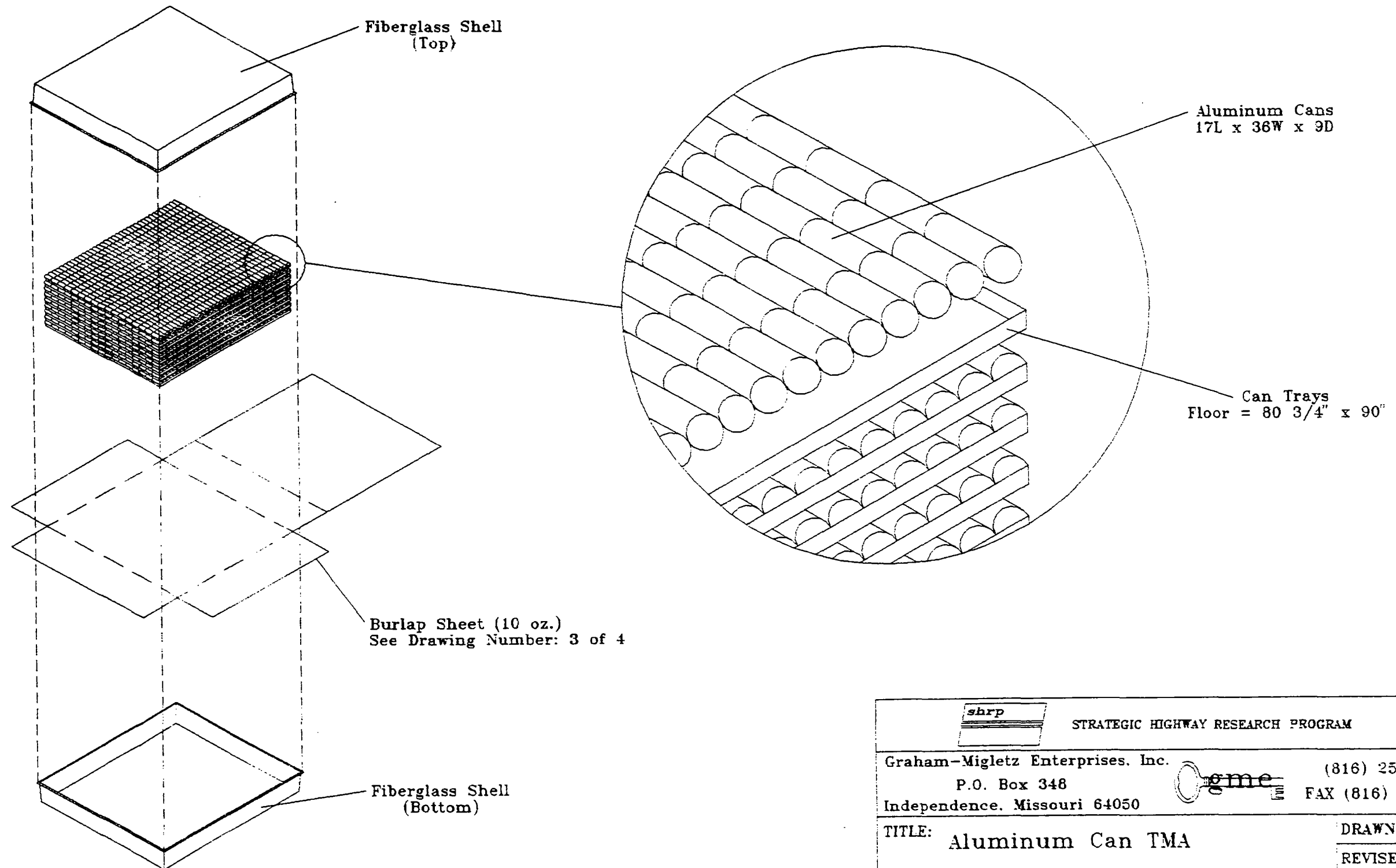
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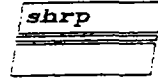
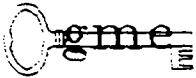
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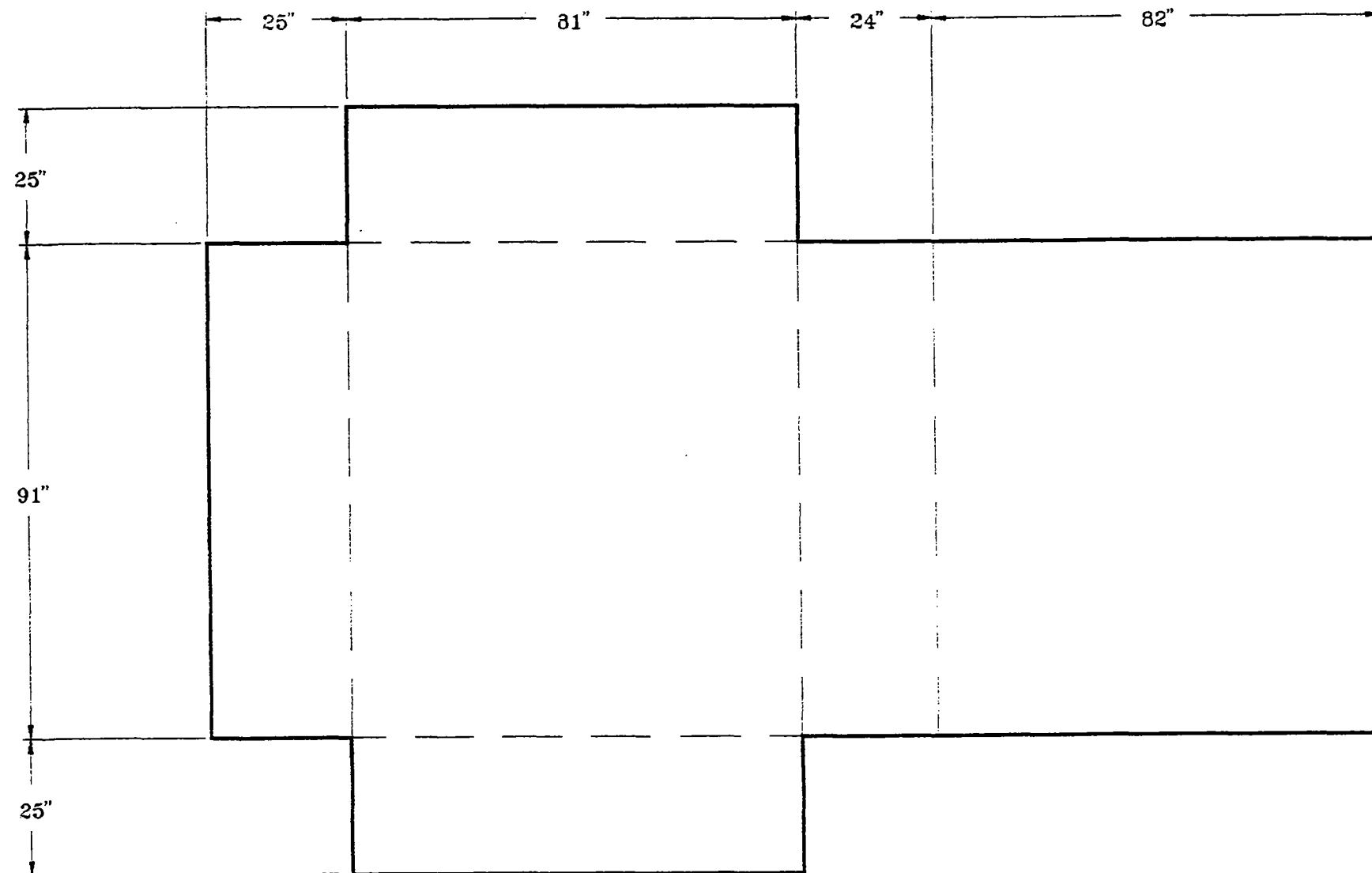
DATE: 9-10-92



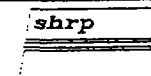
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	Aluminum Can TMA DRAWN BY: JMM REVISED: ---
ASSEMBLY:	N/A SCALE: None
DRAWING NUMBER:	1 of 4 DATE: 8-26-92



 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	DRAWN BY: JMM
ASSEMBLY: N/A	REVISED: ---
DRAWING NUMBER: 2 of 4	SCALE: None
	DATE: 8-26-92

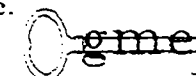


Note:
Dotted lines indicate
where shroud should be
folded to enclose can array.



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

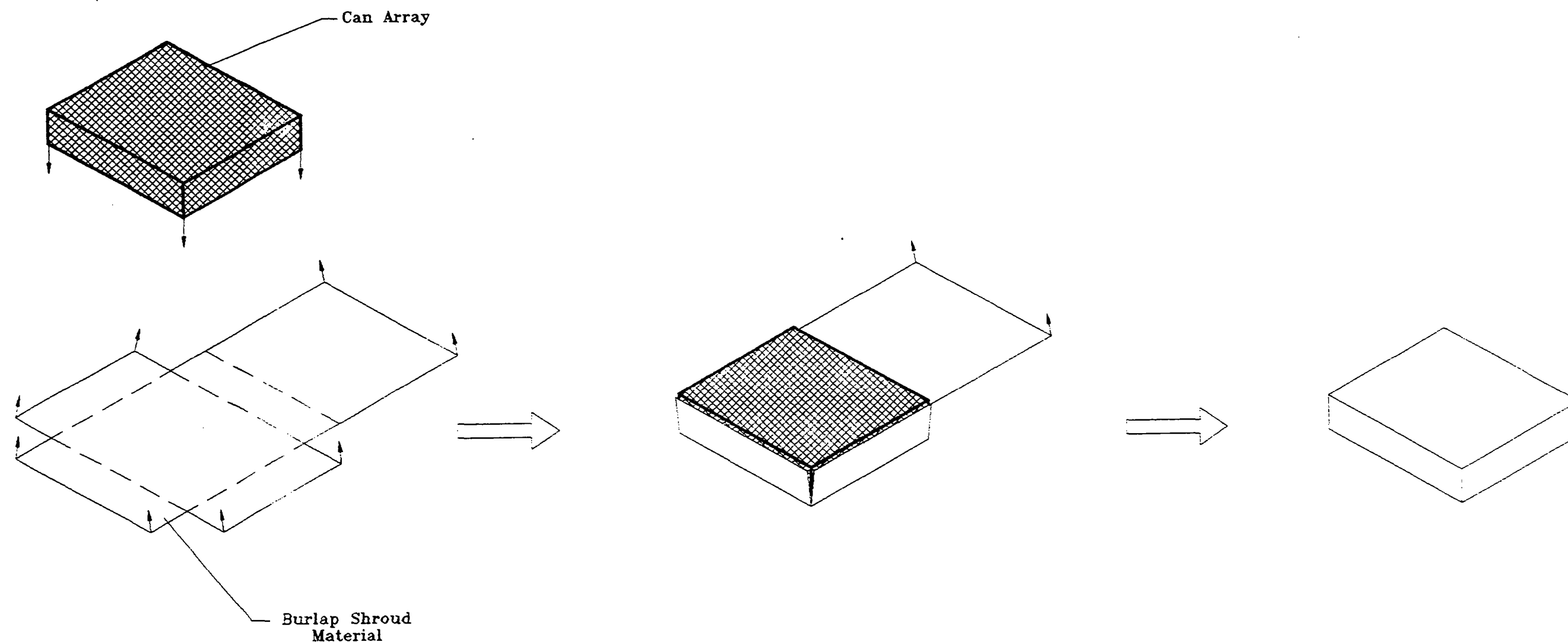
REVISED: ---

ASSEMBLY: N/A


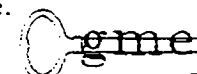
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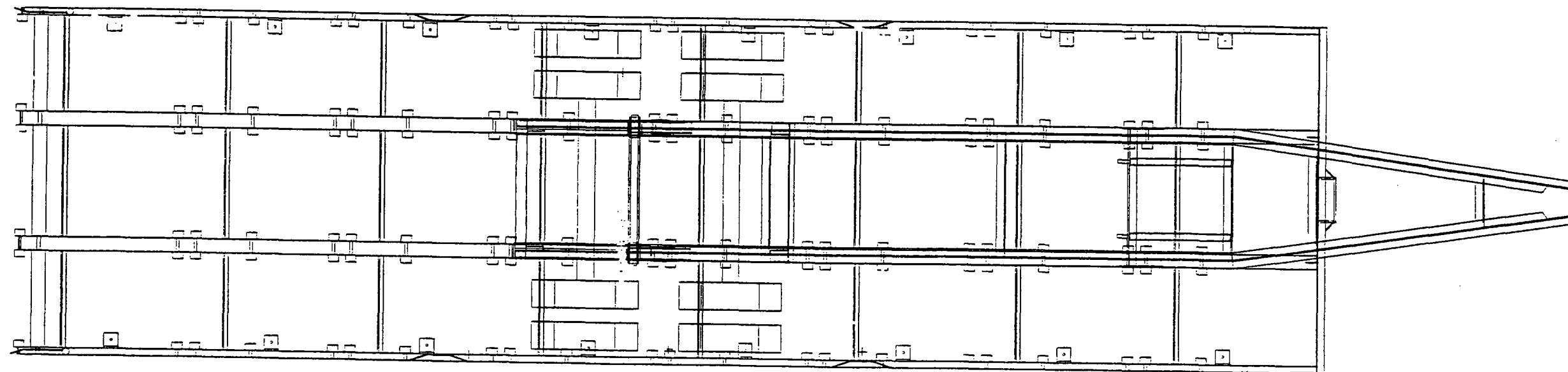
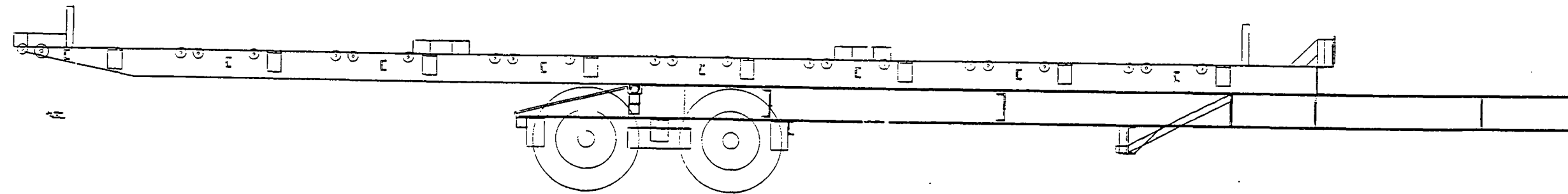
DRAWING NUMBER: 3 of 4

DATE: 8-26-92

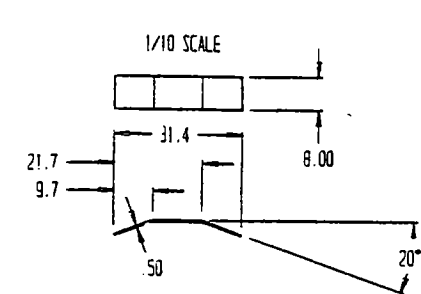
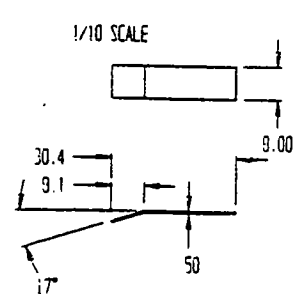
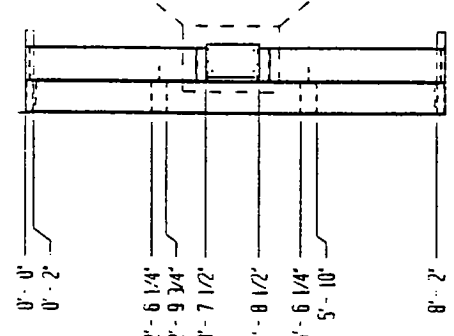
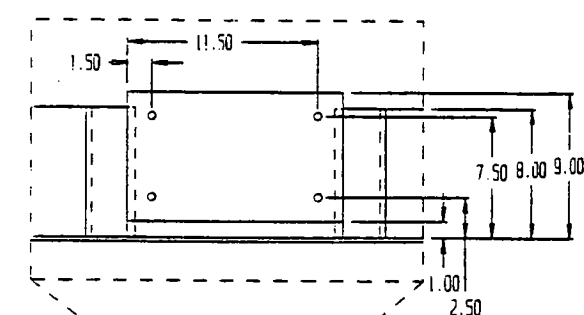
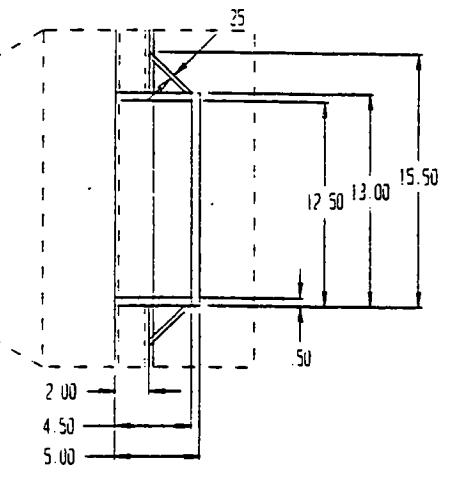
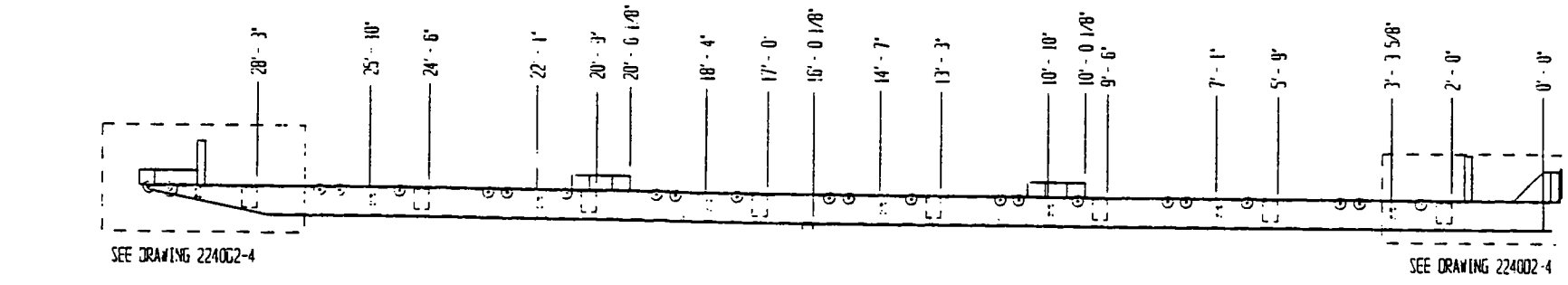
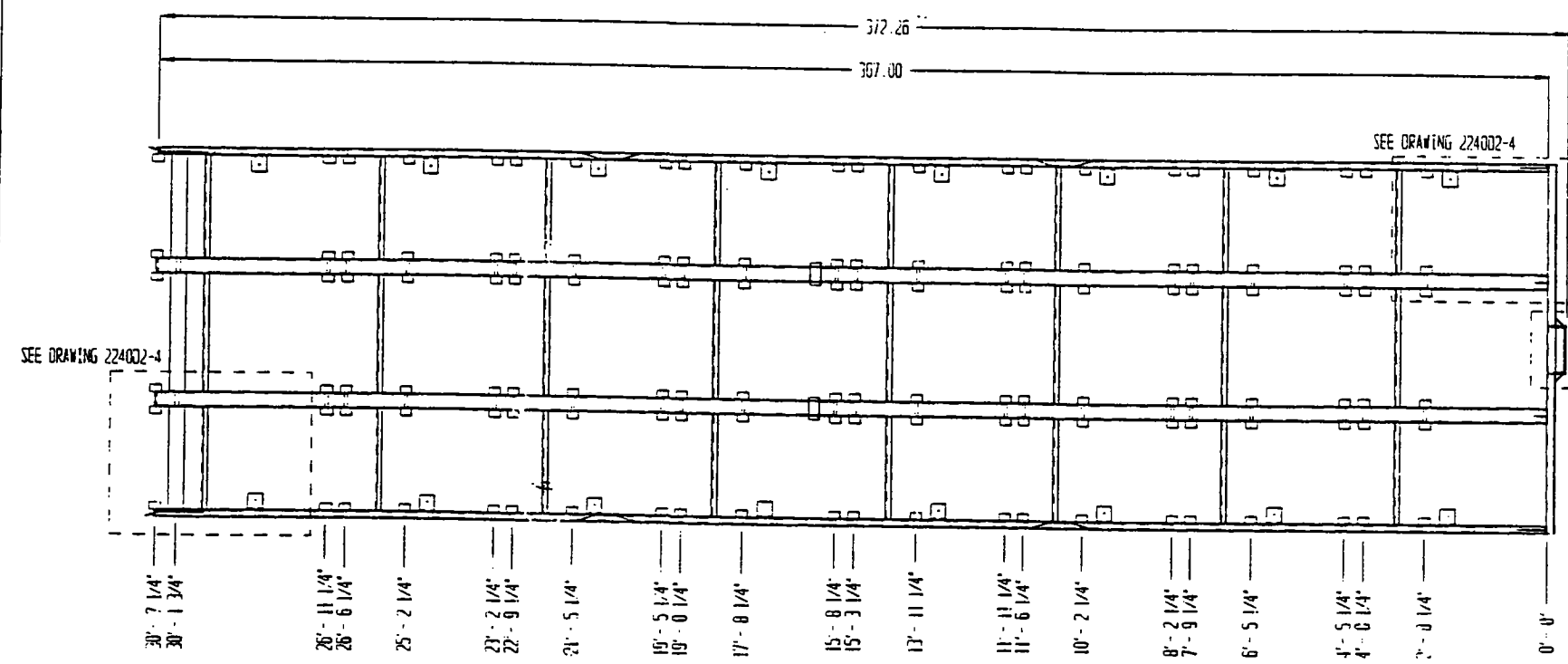


Note:
Shroud is folded as shown around can/cardboard tray array,
then banded together or stapled at seams.

 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 Shroud)	
DRAWN BY: JMM	
REVISED: ---	
ASSEMBLY: N/A	
SCALE: None	
DRAWING NUMBER: 4 of 4	
DATE: 8-26-92	



UNLESS OTHERWISE SPECIFIED 1. DIMENSIONS ARE IN INCHES 2. BREAK SHARP EDGES & DEBURR 3. TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 0.031 15° 30'		CONTRACT NO. 2240		ENSCO, INC. SPRINGFIELD, VIRGINIA	
MATERIAL		APPROVALS	DATE	TOTE TRAILER TILT BED	
FINISH		DRAWN ERIC SMALLIDGE			
NEXT ASSY		CHECKED			
USED ON		TRUCK			
APPLICATION		703/321-9000		SIZE D	SCALE 1/10

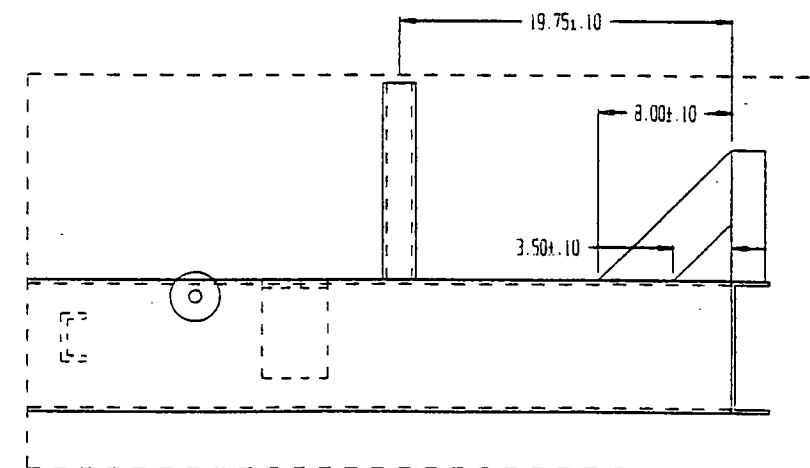
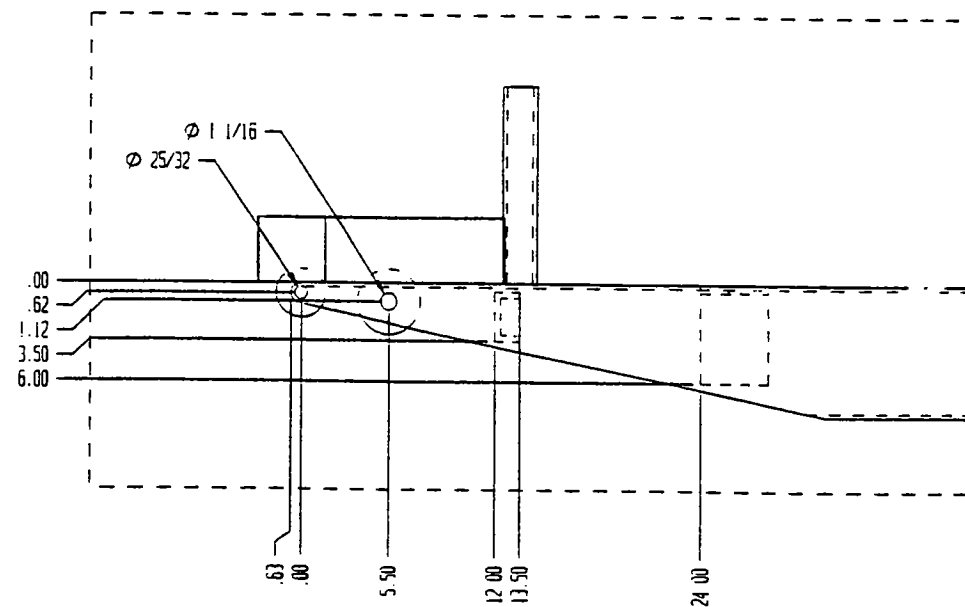
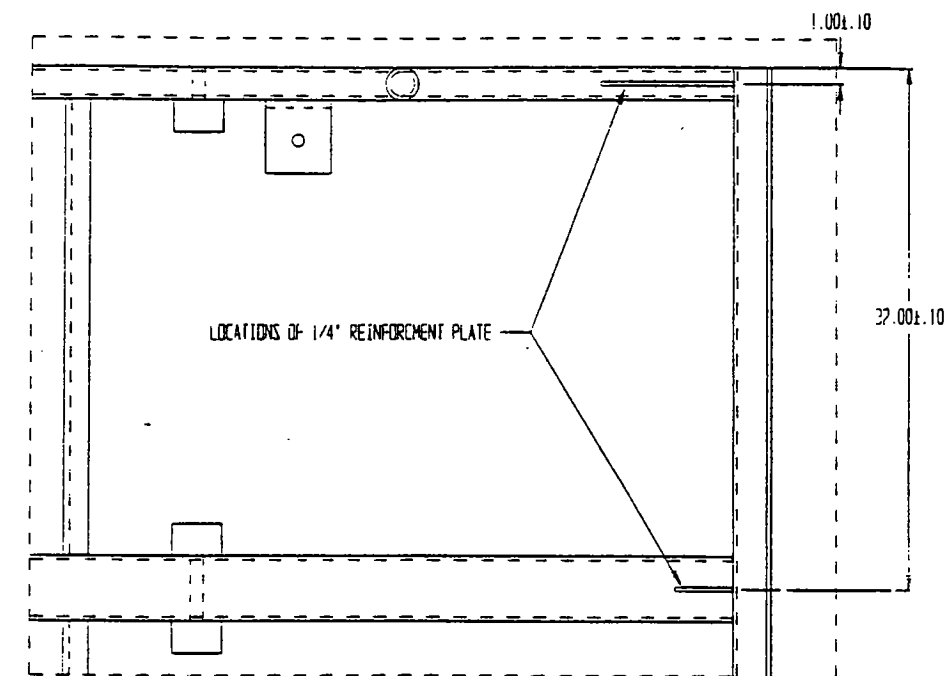
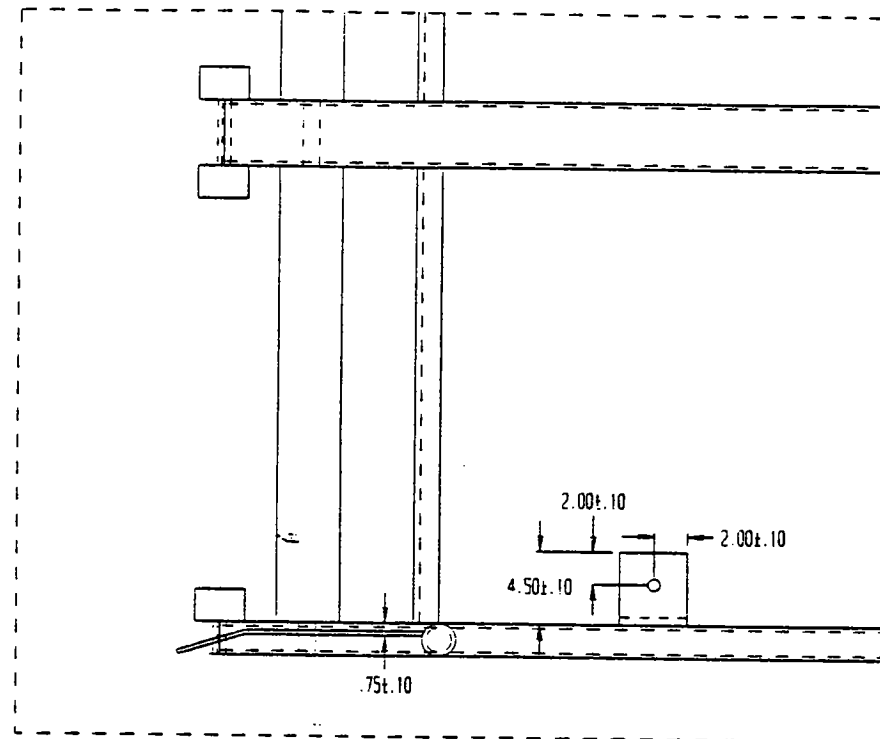


NOTE:
TOLERANCE ON ALL DIMENSIONS
IS 1/8"

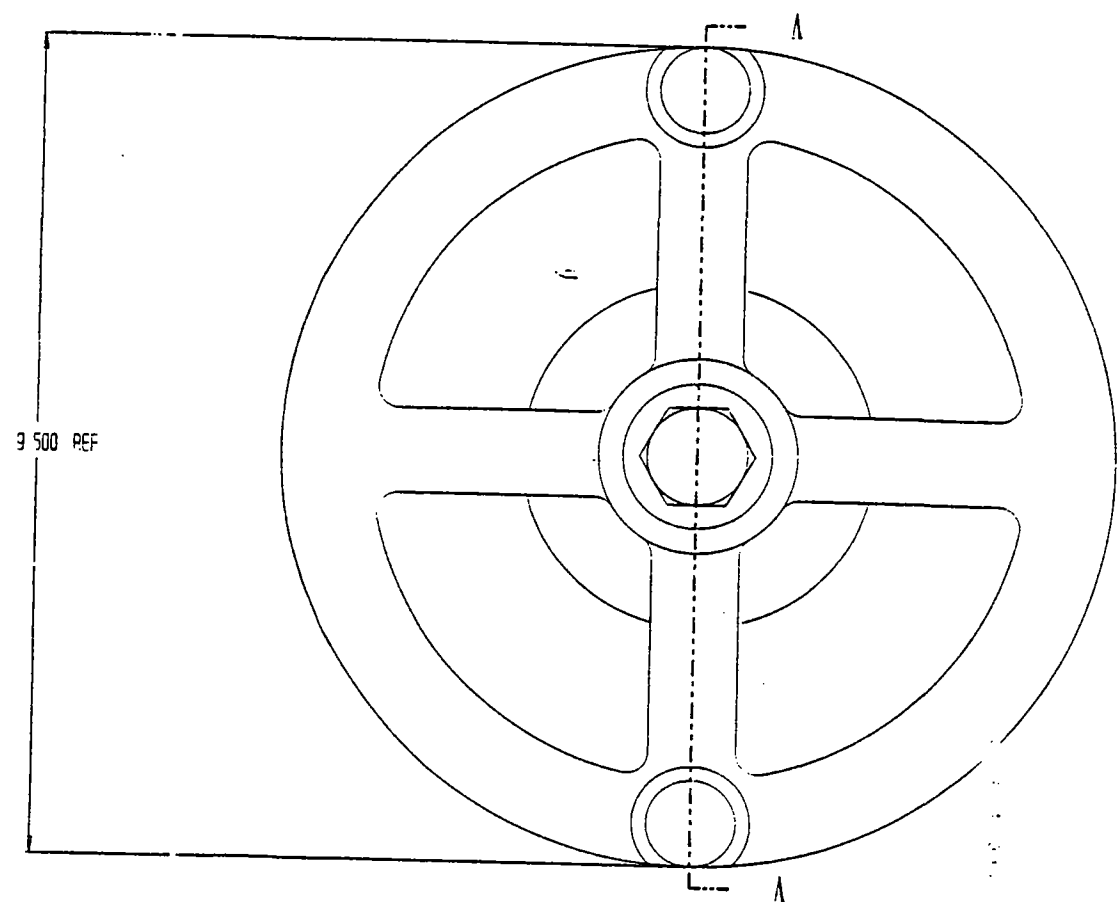
UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		2240		APPROVALS		DATE	
1. DIMENSIONS ARE IN INCHES		DRAWN		ERIC SMALLIDGE		CHECKED		DATE	
2. BREAK SHARP EDGES & DEBURR		MATERIAL		FINISH		SIZE		FORD NO.	
3. TOLERANCES ARE:		11/64		XX ± .01		10" ± .01		ONE NO.	
FRACTIONS DECIMALS		ANGLES		10" ± .01		10" ± .01		DATE	
NEXT ASSY		USED ON		APPLICATION		703/321-9000		SHEET	

ENSCO, INC.
SPRINGFIELD, VIRGINIA

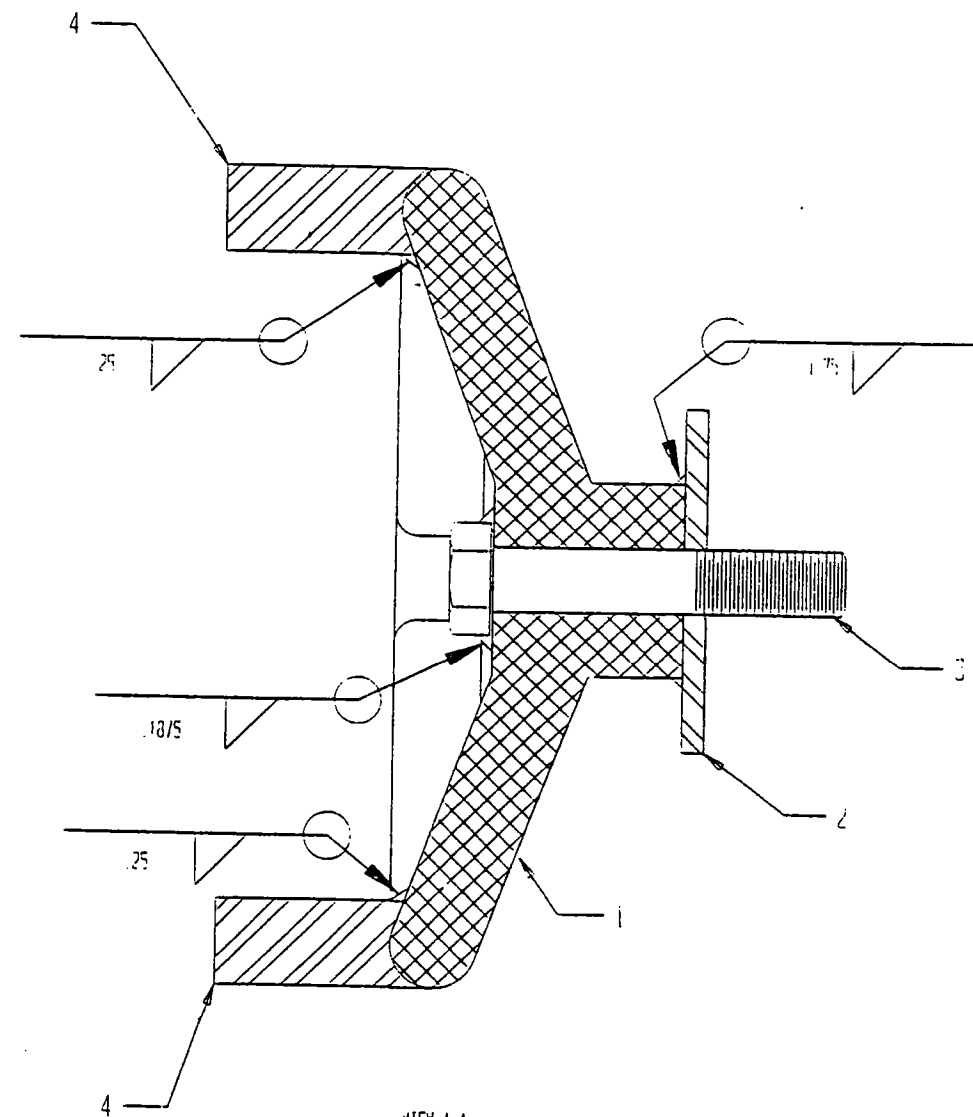
FRAME LAYOUT DETAILS



UNLESS OTHERWISE SPECIFIED 1. DIMENSIONS ARE IN INCHES 2. BREAK SHARP EDGES & DEBURR 3. TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 .005 10° 10'		CONTRACT NO. 2240		ENSCO, INC. SPRINGFIELD, VIRGINIA	
MATERIAL:		APPROVALS ERIC SWALLIDGE		DATE	
FINISH:		CHECKED		SIZE D	
NEXT ASSY		USED ON		ENG. NO. 224002-4	
APPLICATION		703/321-9000		SCALE 1/5	

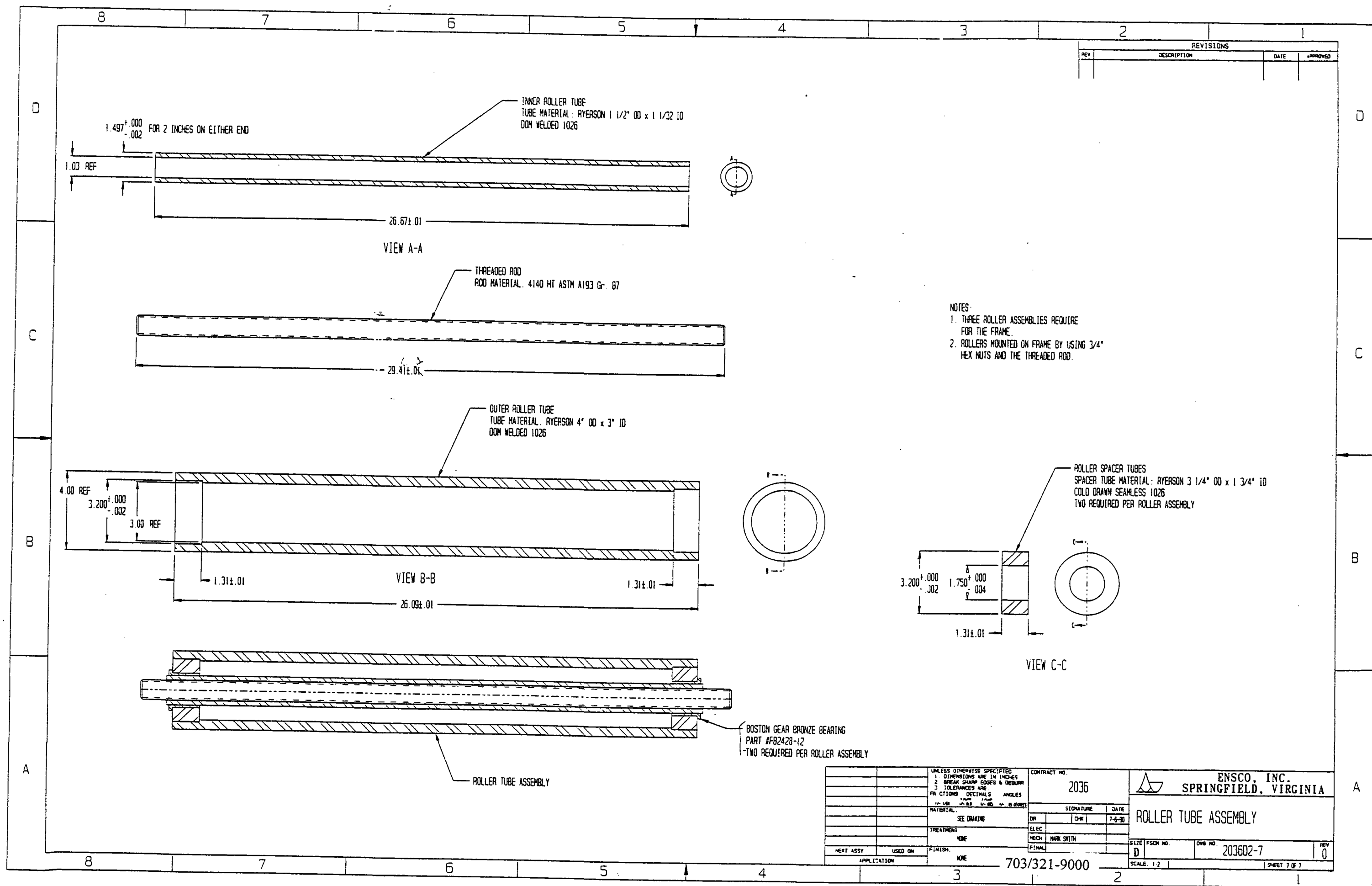


- NOTES
1. McMASTER-CARR CAST IRON HANDWHEEL, PART #6025K21
BORE 25/32" HOLE THRU HANDWHEEL FOR TIGHTENING BOLT.
 2. BACKING PLATE, 4" OD WITH 25/32" ID, .25" THICK.
MATERIAL - ASTM A36.
 3. TIGHTENING BOLT - 3/4"x4" UNC GRADE 2 MACHINE BOLT.
 4. TIGHTENING LUGS, 1" DIA, ASTM A-36 BAR, TRIM BAR
ENDS TO CONFORM TO HAND WHEEL SHAPE THEN WELD TO HAND WHEEL.



VIEW A-A

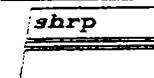
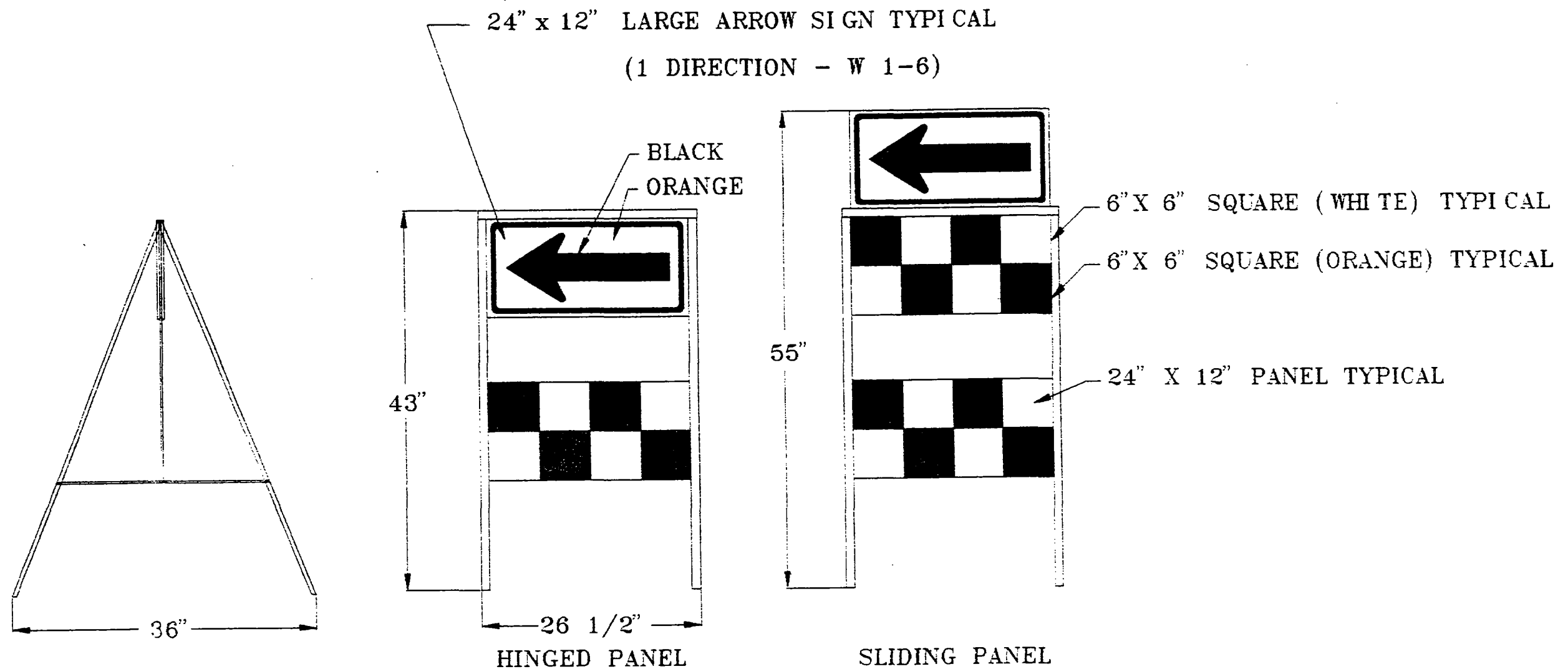
UNLESS OTHERWISE SPECIFIED: 1. DIMENSIONS ARE IN INCHES 2. BREAK SHARP EDGES & CORNERS 3. TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 1/32 1/64 .005 .010 .015 .020 .030 .040 .050 .060 .070 .080 .090 .100 .125 .150 .175 .200 .250 .300 .375 .500 .625 .750 .875 1.000 1.250 1.500 1.750 2.000 2.500 3.000 3.750 4.000 5.000 6.000 7.000 8.000 10.000 12.000 15.000 20.000 25.000 30.000 35.000 40.000 45.000 50.000 60.000 70.000 80.000 90.000 100.000		CONTRACT NO. 2036		ENSCO, INC. SPRINGFIELD, VIRGINIA	
MATERIAL STEEL DRAWING		SIGNATURE DATE 8/25/90		PALLET TIGHTENING HANDWHEELS	
TREATMENT NONE		DR CHK APP DATE 8/25/90		DATE/PSCH NO D	
NEXT ASSY USED BY APPLICATION		FINISH NONE		DWG NO 203602-6	
703/321-9000		2		REV 0	
				SHEET 6 OF 7	



REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

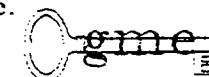
- NOTES:
- THREE ROLLER ASSEMBLIES REQUIRE FOR THE FRAME.
 - ROLLERS MOUNTED ON FRAME BY USING 3/4" HEX NUTS AND THE THREADED ROD.

UNLESS OTHERWISE SPECIFIED 1. DIMENSIONS ARE IN INCHES 2. BREAK SHARP EDGES & DEBURR 3. TOLERANCES ARE		CONTRACT NO. 2036		ENSCO, INC. SPRINGFIELD, VIRGINIA	
FRACTIONS DECIMALS ANGLES		SIGNATURE		DATE	
1/16 1/32 1/64 1/8 1/4 1/2 3/4 1 1 1/2 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		OR		7-6-90	
MATERIAL SEE DRAWING		ELEC		MECH MARK SMITH	
TREATMENT NONE		FINAL			
HERT ASSY	USED ON	APPLICATION		703/321-9000	
SIZE FSCN NO.		DWS NO.		REV	
D		203602-7		0	
SCALE 1:2		SHEET 1 OF 1			



STRATEGIC HIGHWAY RESEARCH PROGRAM

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



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

TITLE:
DIRECTION INDICATOR BARRICADE

DRAWN BY: RLM

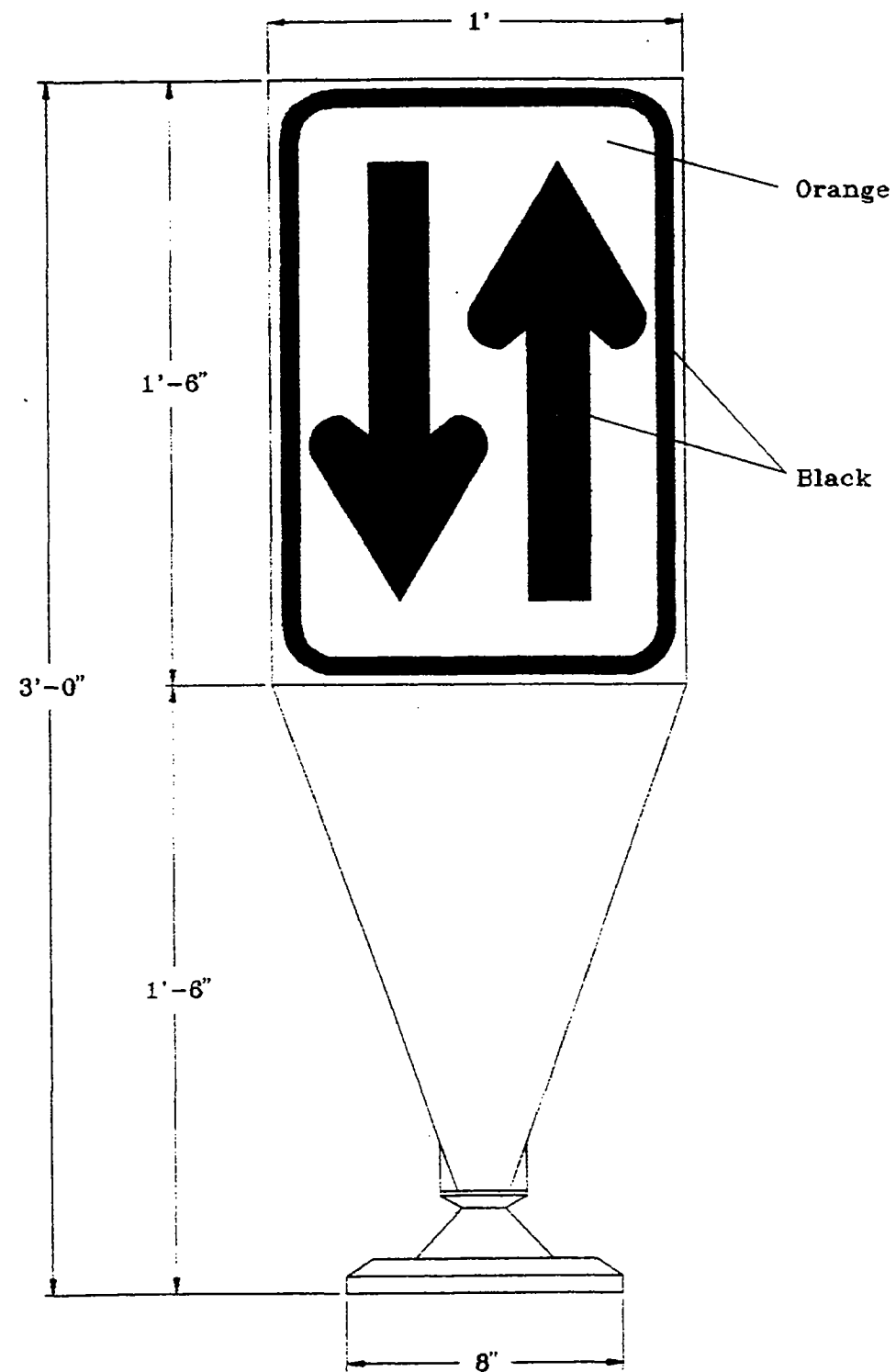
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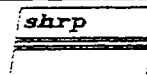
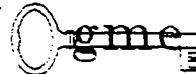
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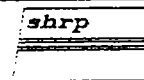
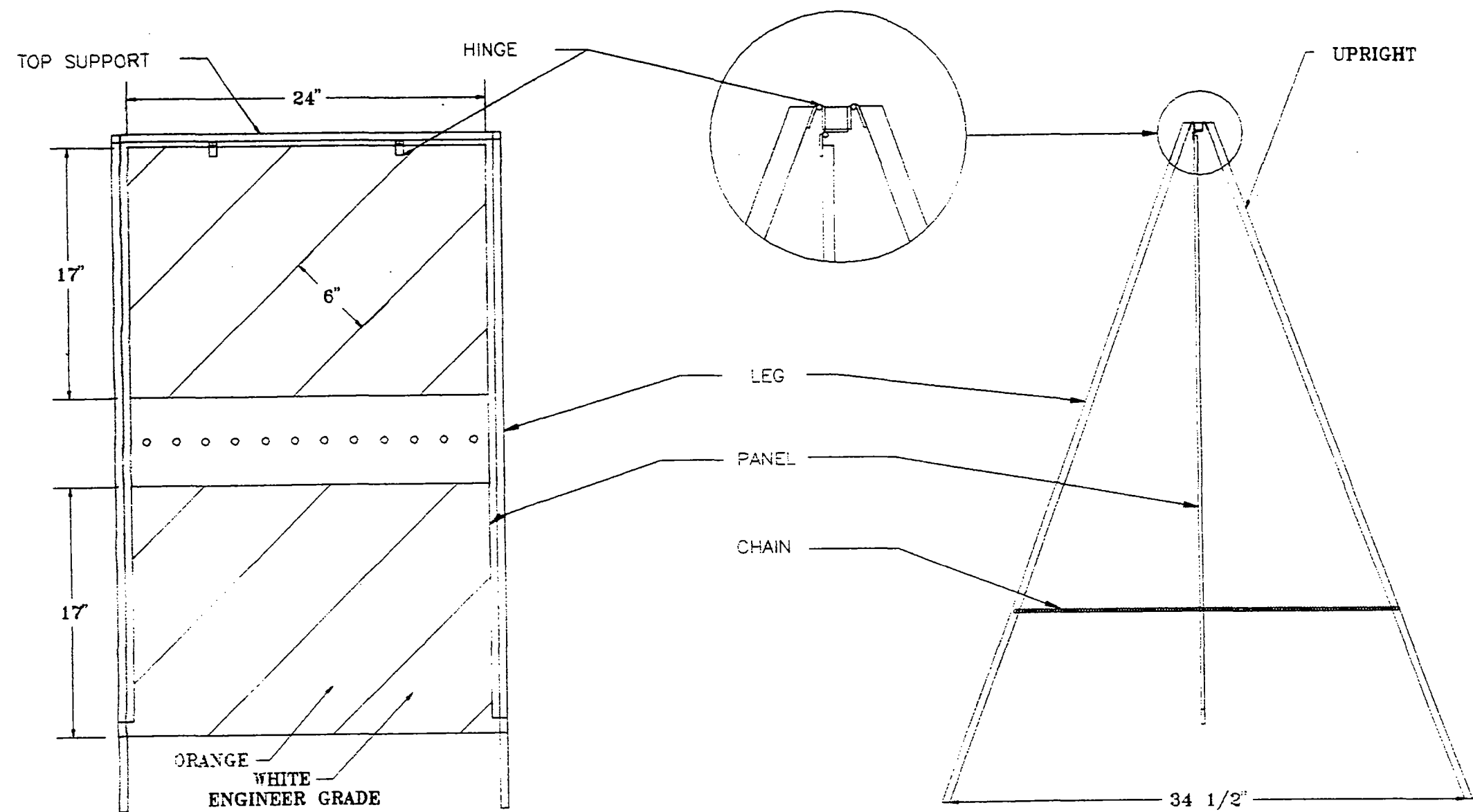
SCALE: NONE

DRAWING NUMBER: 1 OF 1

DATE: 9-24-92



 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
Opposing Traffic Lane Divider	REVISED: ---
ASSEMBLY: N/A	SCALE: 1/8
DRAWING NUMBER: 1 of 1	DATE: 8-25-92



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

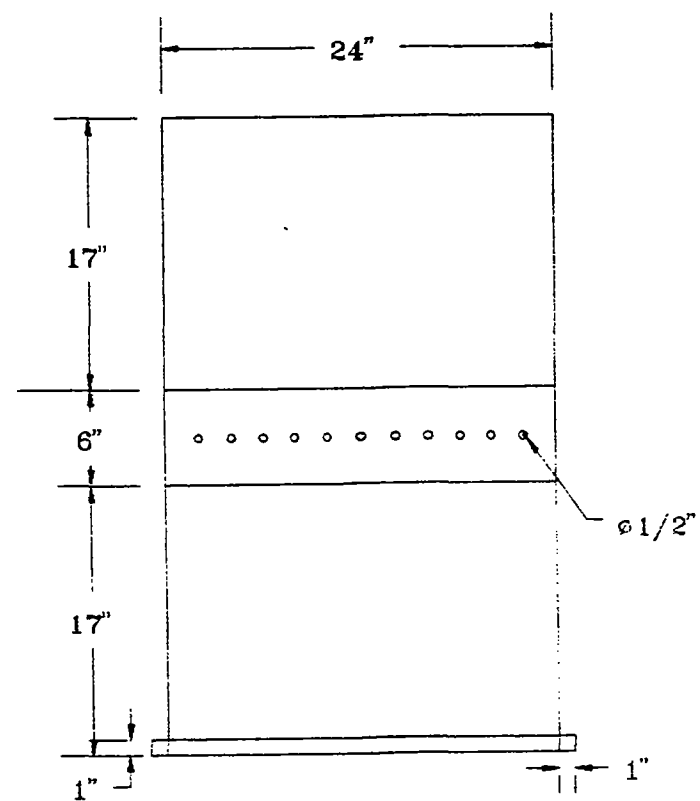
REVISED: RLM

ASSEMBLY: N/A

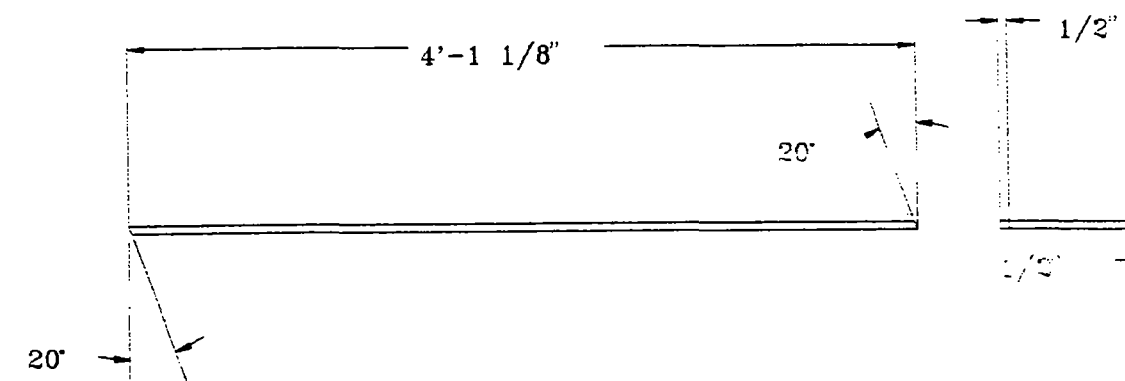
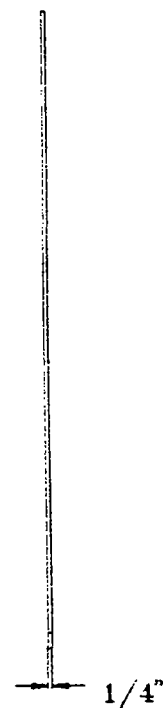
SCALE: NCNE

DRAWING NUMBER: 1 OF 4

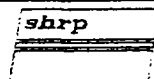
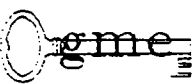
DATE: 8-13-92

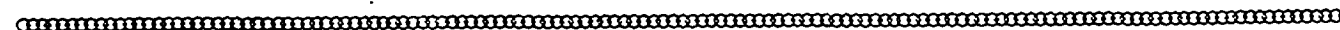


PANEL

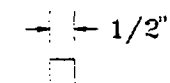
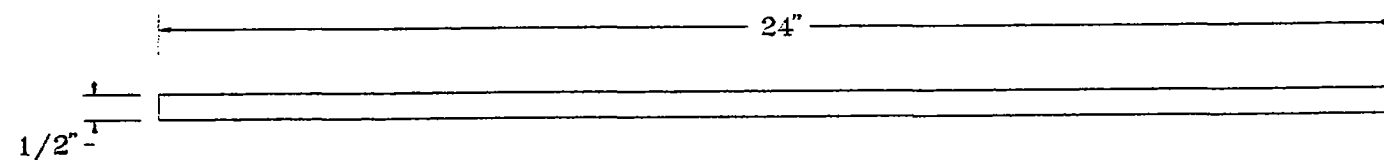


LEG SUPPORT

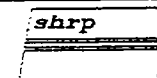
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	DRAWN BY: JMM
PORTABLE SOFT BARRICADE SYSTEM	REVISED: RLM
ASSEMBLY: N/A	SCALE: NONE
DRAWING NUMBER: 2 OF 4	DATE: 8-13-92



2'-2" CHAIN FOR LEG SUPPORT

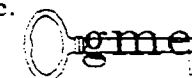


TOP SUPPORT



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

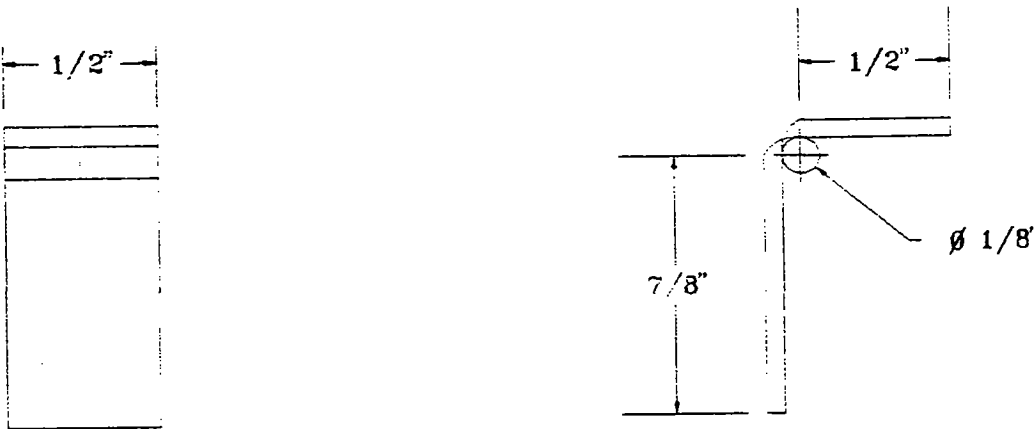
ASSEMBLY: N/A



SCALE: NONE

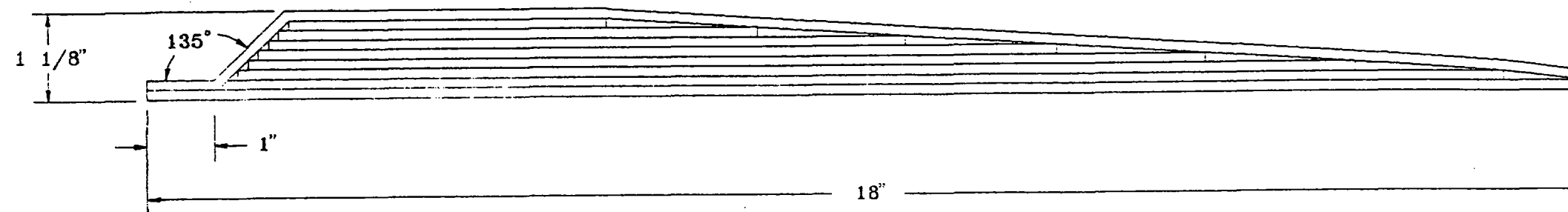
DRAWING NUMBER: 3 OF 4

DATE: 8-13-92

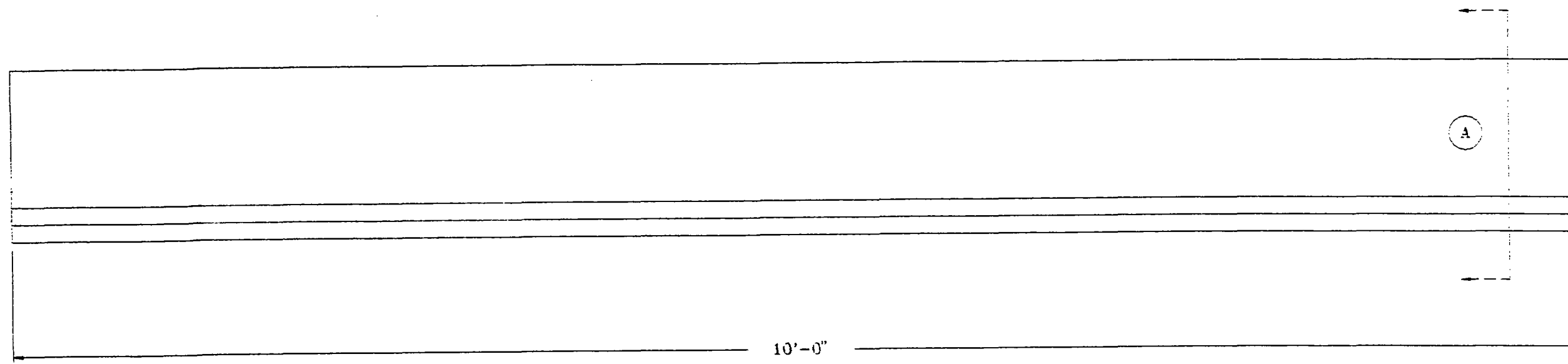
HINGE FOR LEG & PANEL



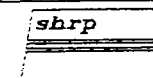
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	DRAWN BY: JMM
PORTABLE SOFT BARRICADE SYSTEM	REVISED: RLM
ASSEMBLY: N/A	SCALE: NONE
DRAWING NUMBER: 4 OF 4	DATE: 8-13-92



SECTION A



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

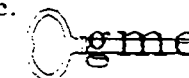


STRATEGIC HIGHWAY RESEARCH PROGRAM

Graham-Migletz Enterprises, Inc.

P.O. Box 348

Independence, Missouri 64050



(816) 254-1788

FAX (816) 254-4654

TITLE: Portable Speed Bump

DRAWN BY: JMM

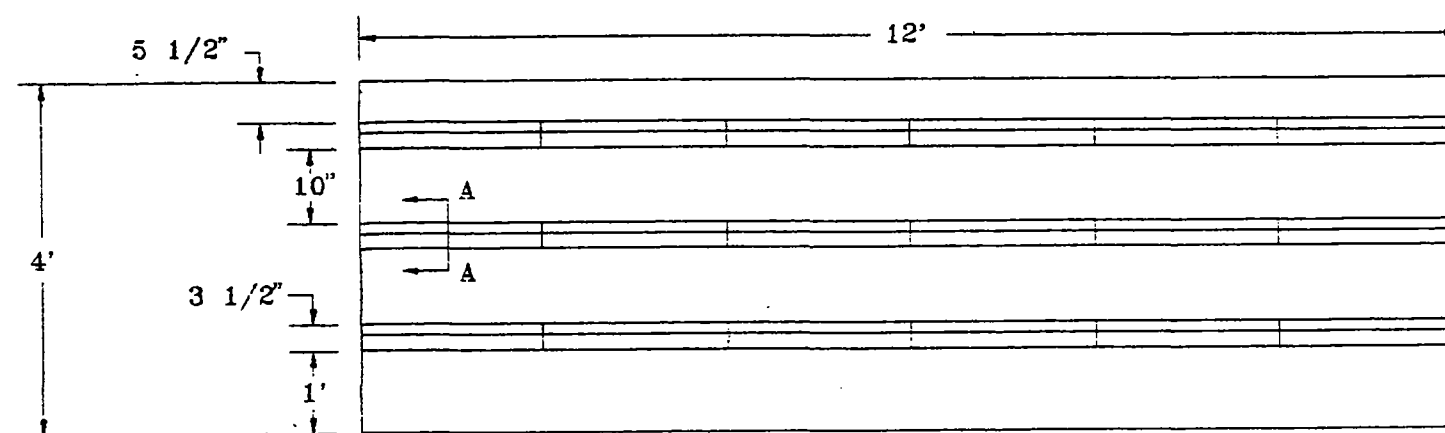
REVISED: ---

ASSEMBLY: N/A

SCALE: None

DRAWING NUMBER: 1 of 1

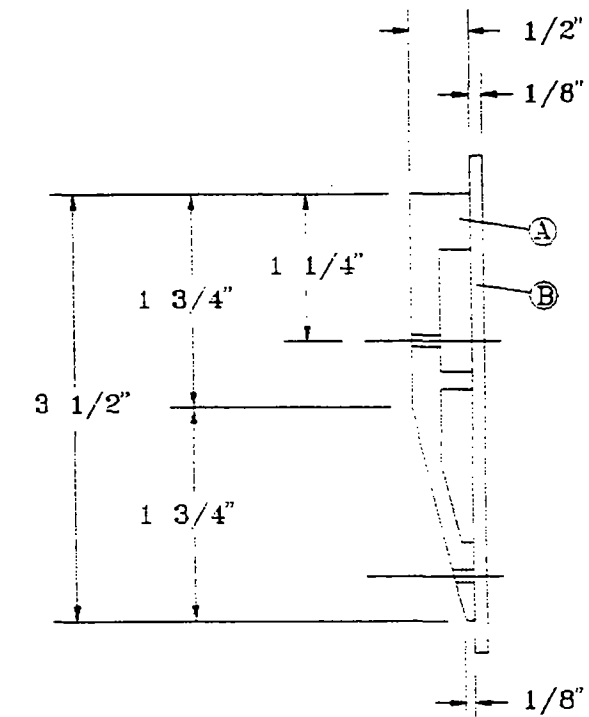
DATE: 8/25/92



Rumble Mat Assembly



DIRECTION OF TRAFFIC



Section A - A

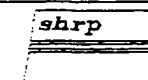


DIRECTION OF TRAFFIC

Ⓐ - Rumble Bar is ABS Plastic (Hard).

Ⓑ - Mat is Neaprene Rubber (Soft).

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



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

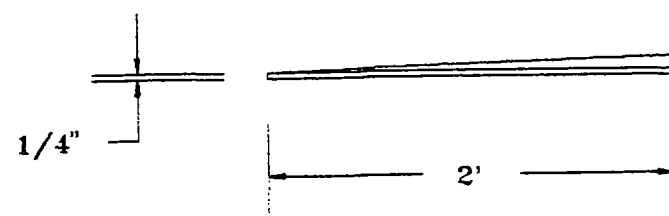
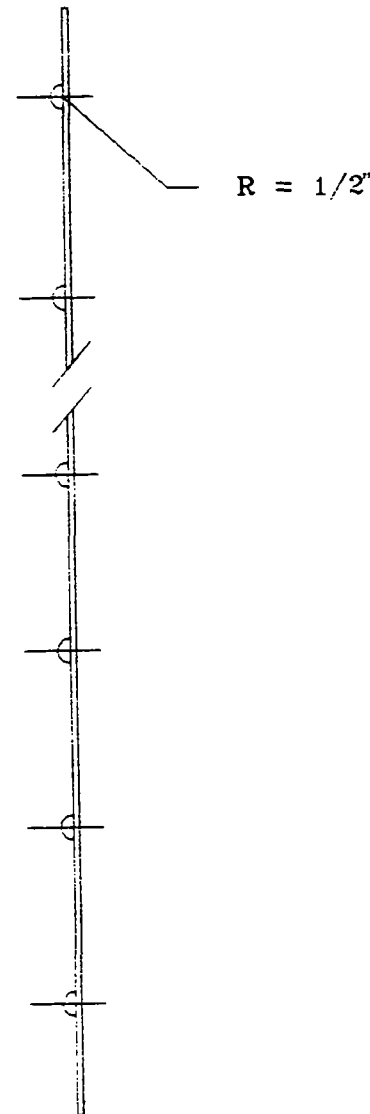
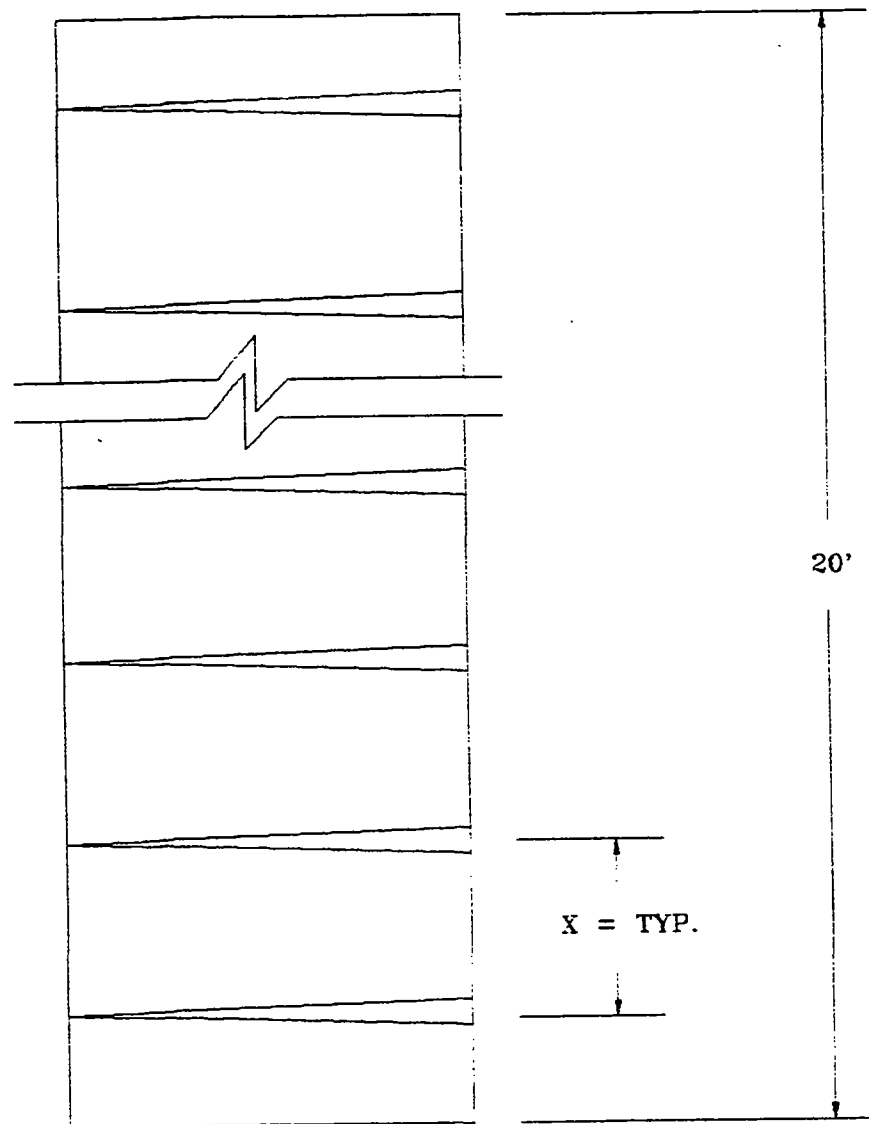
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ASSEMBLY: N/A

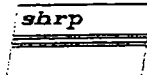

SCALE: None

DRAWING NUMBER: 1 of 1

DATE: 8-25-92

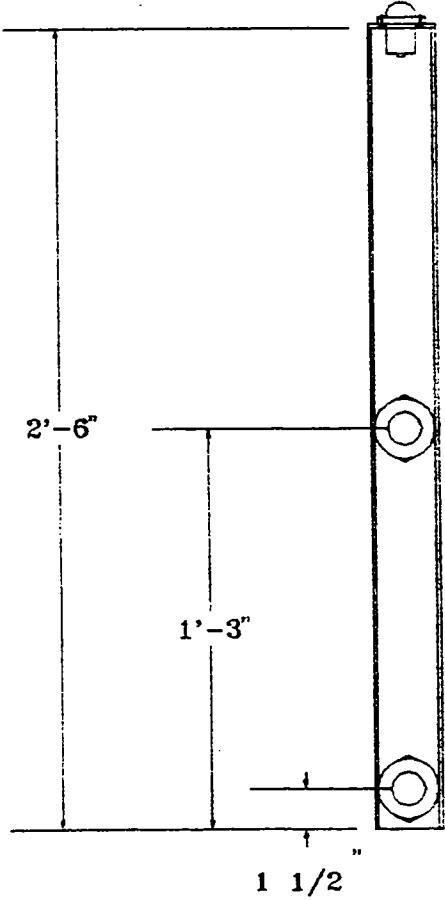
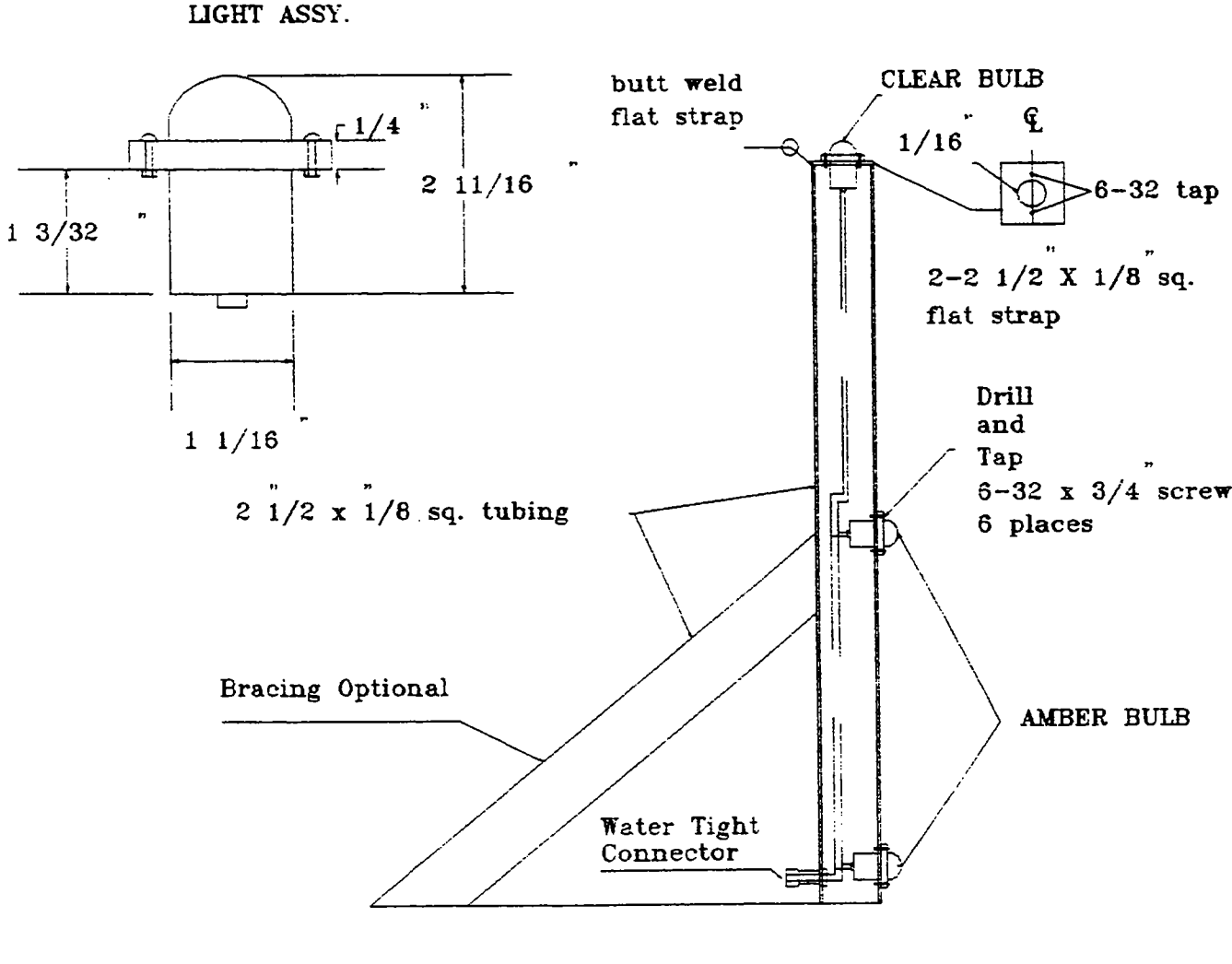


Length = 20 ft.
26 Ridges (Half Cones) Spaced at 9"
X = 9" - Max. Vibration

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

Snow Plow Blade Markers

2 1/2" x 2 1/2" x 1/8" sq. tubing



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

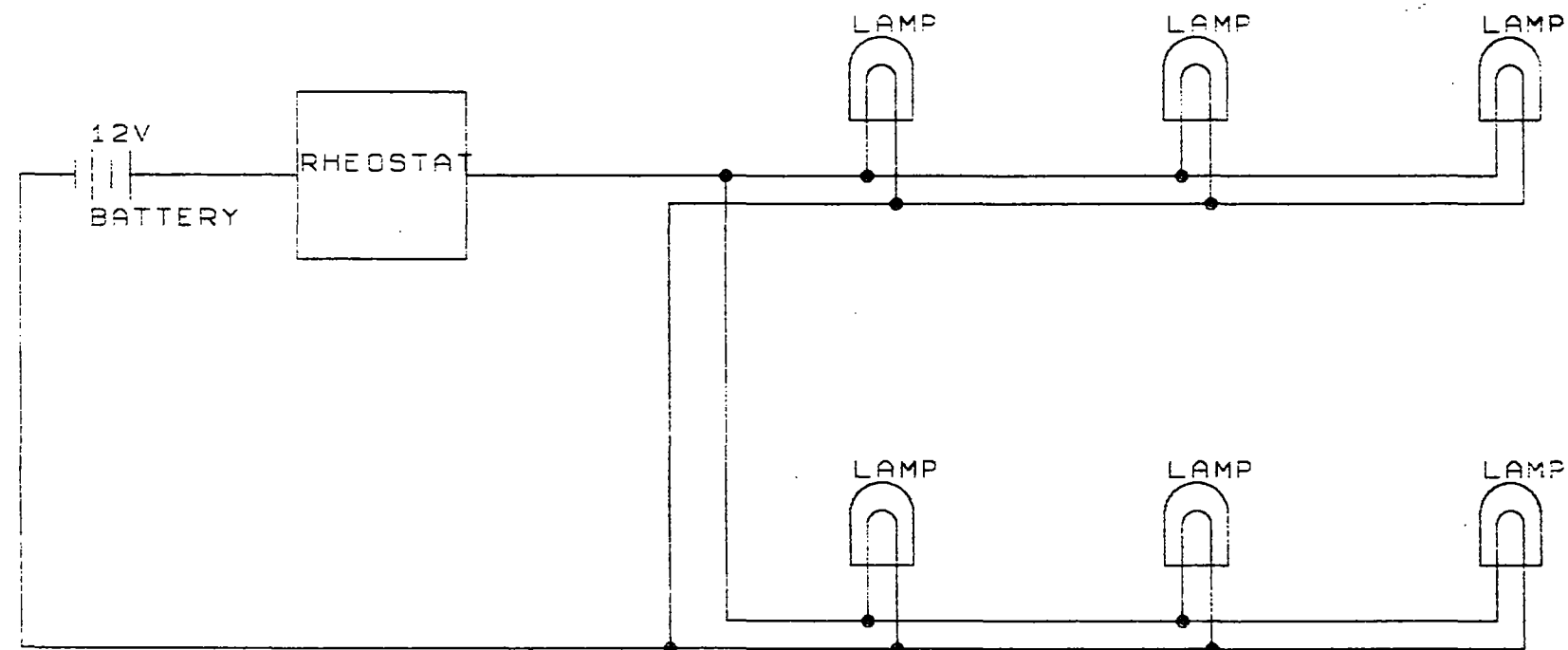
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REVISED: RLM

ASSEMBLY: N/A

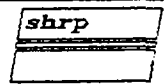

SCALE: NONE

DRAWING NUMBER: 1 OF 2

DATE: 8-10-92



LIGHT ASSEMBLY NUMBER A608
BULB NUMBER A508-14

 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
ASSEMBLY:	ELECTRICAL PLANS
DRAWING NUMBER:	2 OF 2
DRAWN BY:	BBF
REVISD:	BBF
SCALE:	NONE
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	Eprom programable Sequentail Phase 3, 2, 1, off
<u>Sequence timing</u>	
Lights on	1 second
Off between phases	1/10 second
Off time between phase 1 and 3	1 second
<u>Dimensions</u>	
Height	2.5 inches
Width	7.5 inches
Length	9.375 inches

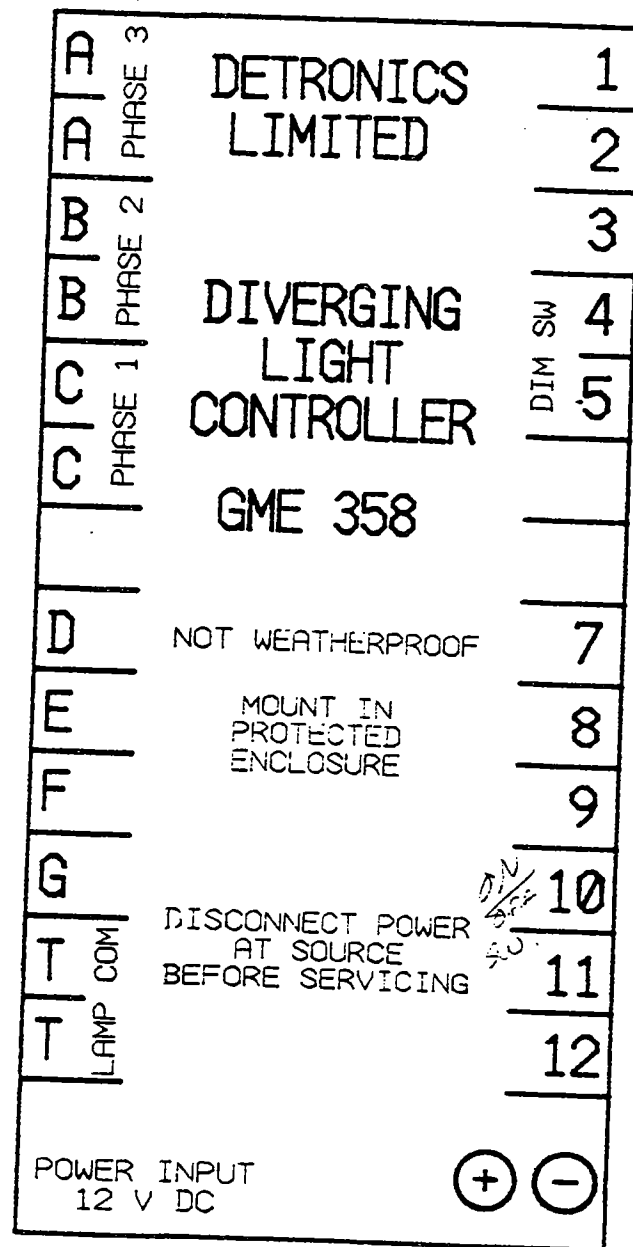
Detronics Limited

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 convenient 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.

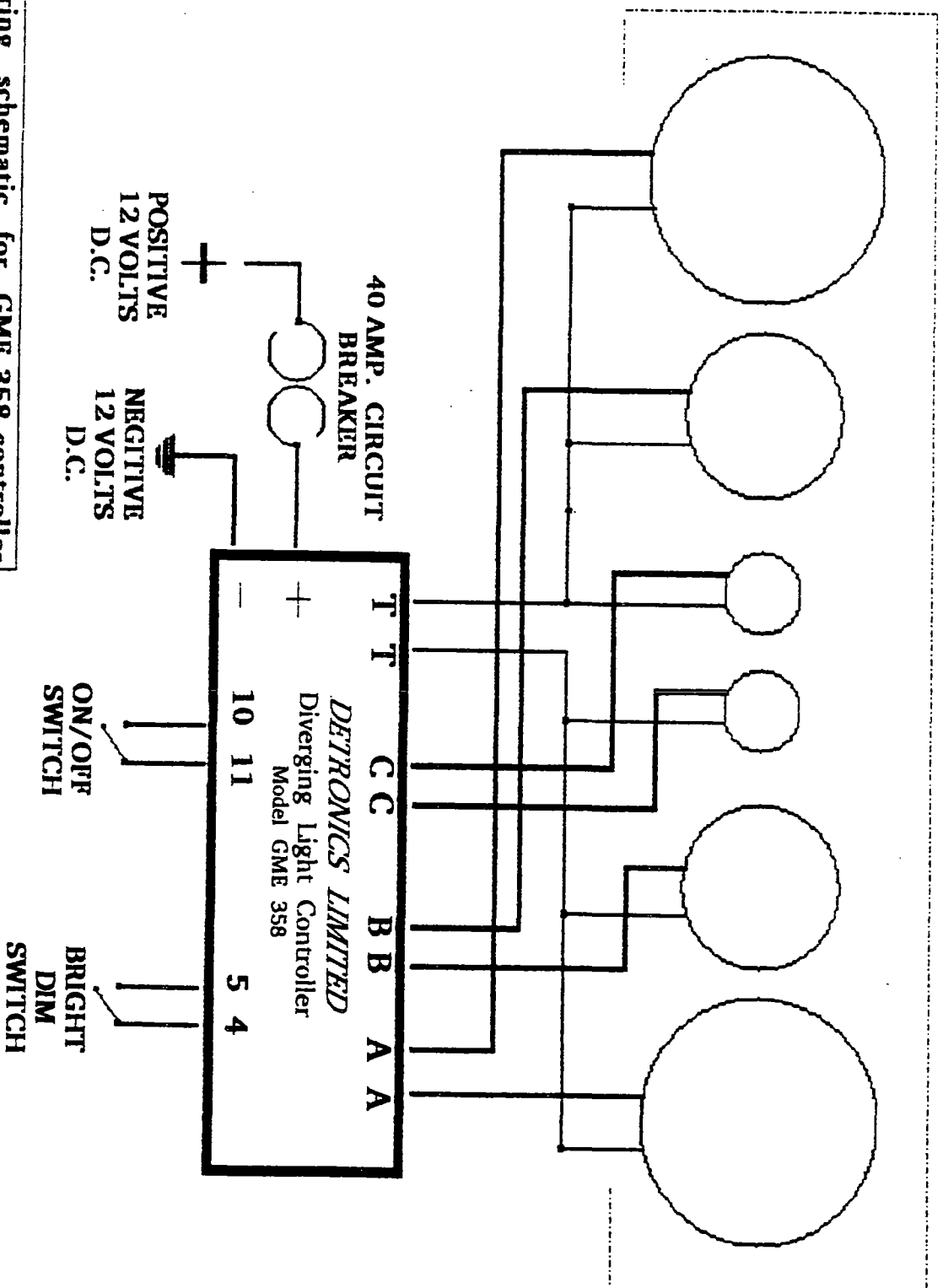
If all the panel display lamps come on and do not flash, check the polarity of the power source.

This device is designed to be powered from a 12 volt, D.C. negative 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 distroyed 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.

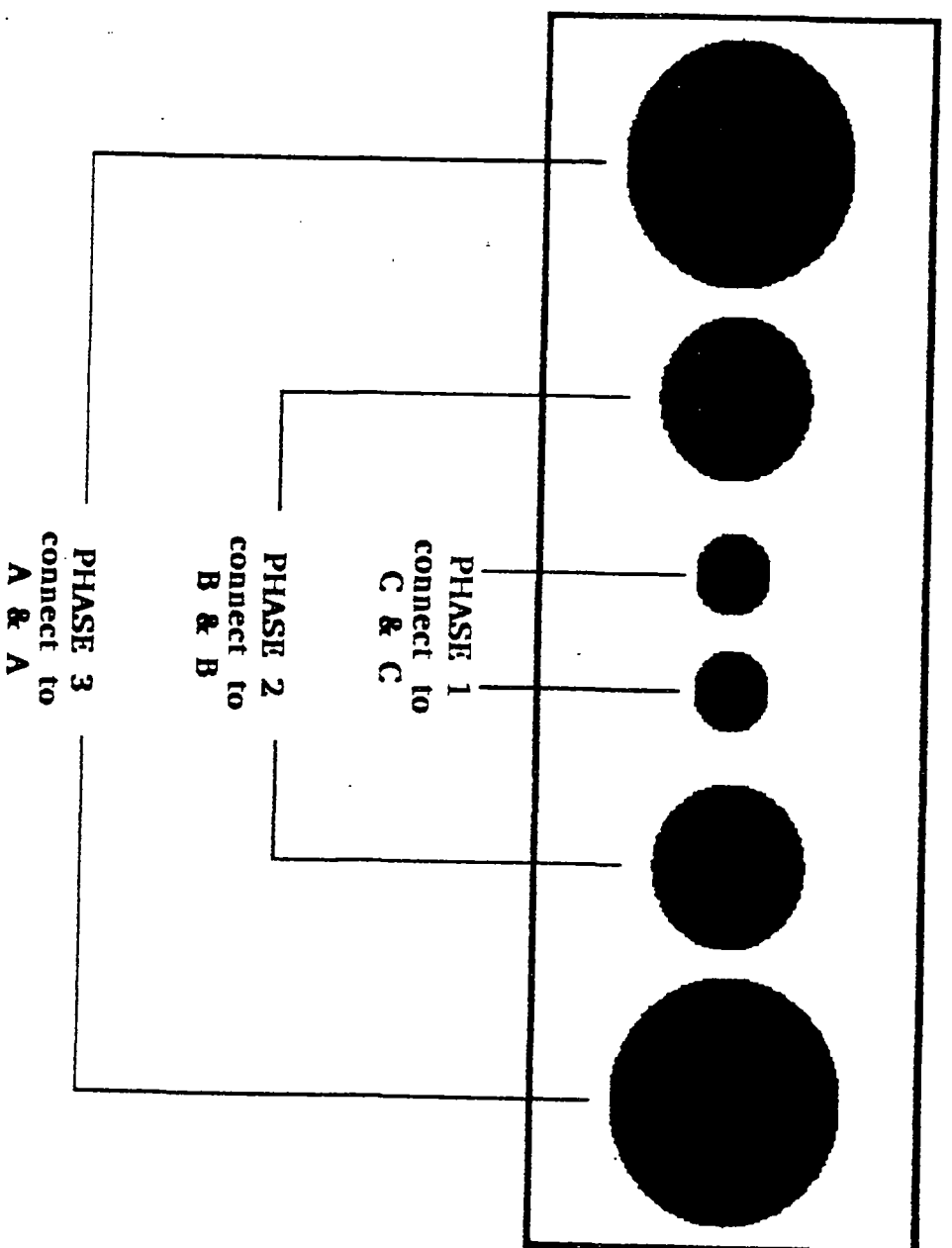
DIVERGING LIGHTS DISPLAY PANEL

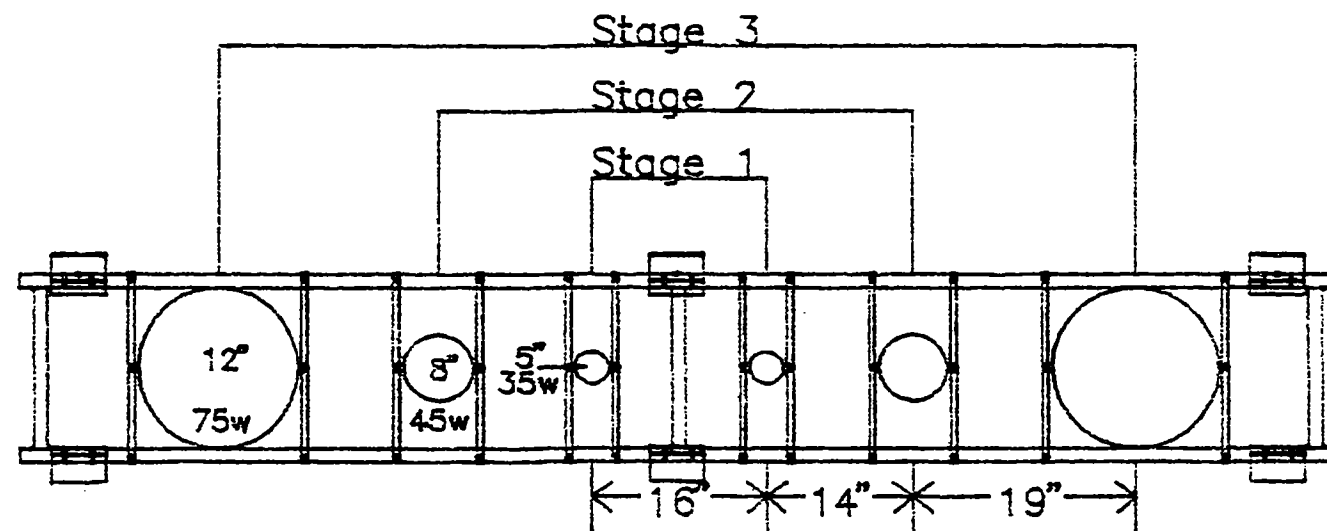


Wiring schematic for GME 358 controller to 6 lamp display panel.

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

DIVERGING LIGHTS DISPLAY
PANEL





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.

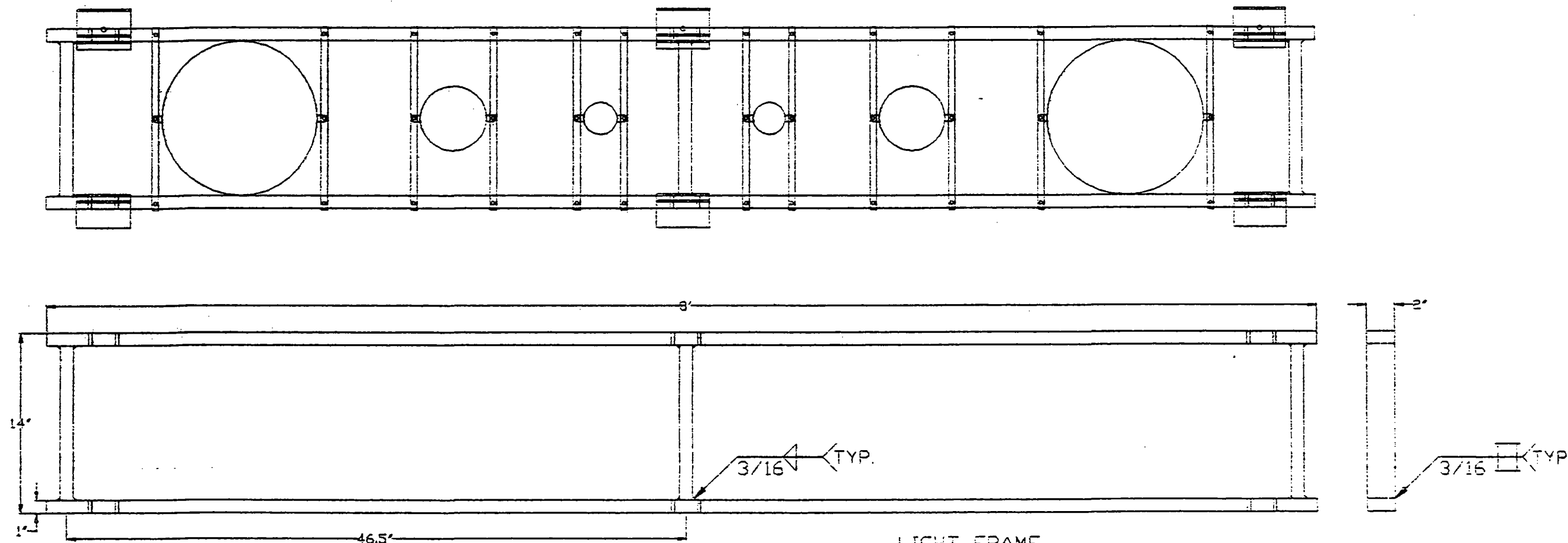
LIGHT SPECIFICATIONS FOR THE DIVERGING LIGHTS

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

SB Sealed Beam
 b Bulb

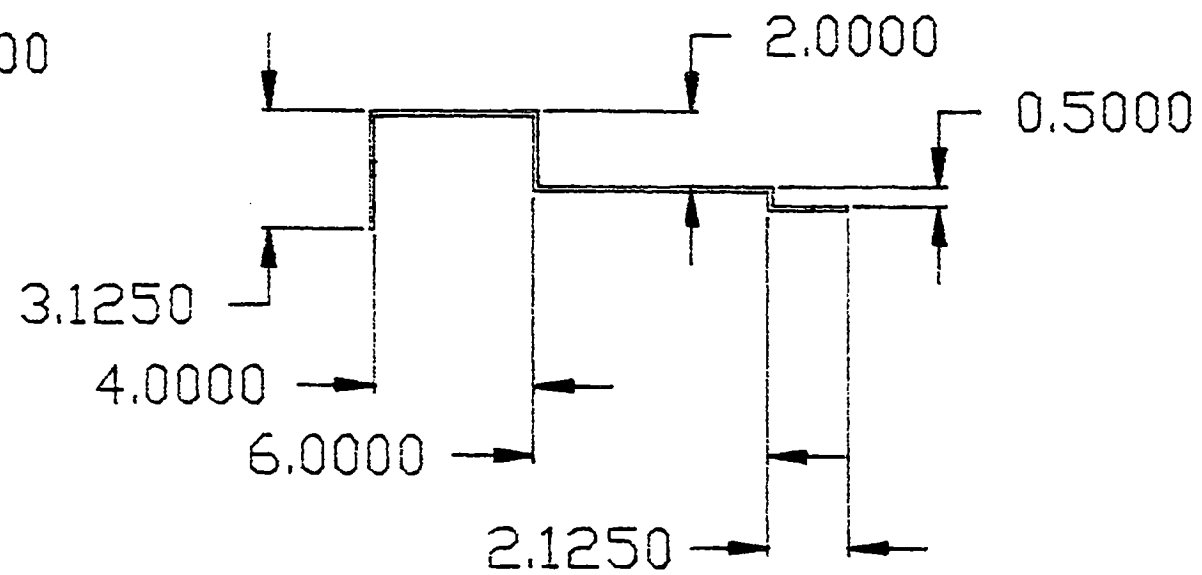
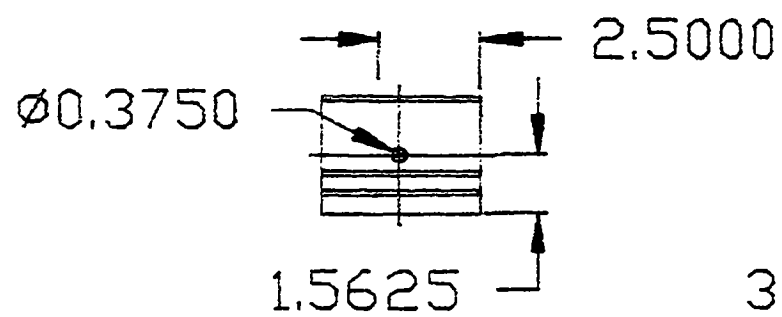
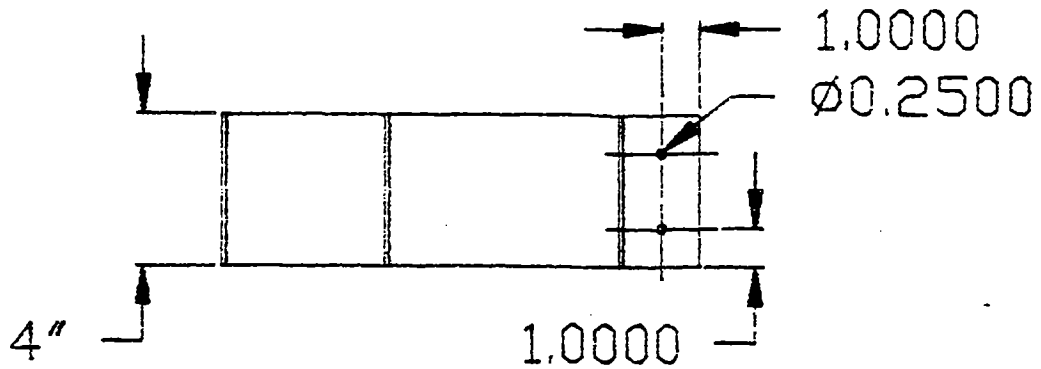
The diameters are the size of the amber lenses, on the small and medium lights they are also the size of the sealed beam.

All lamps are dc.



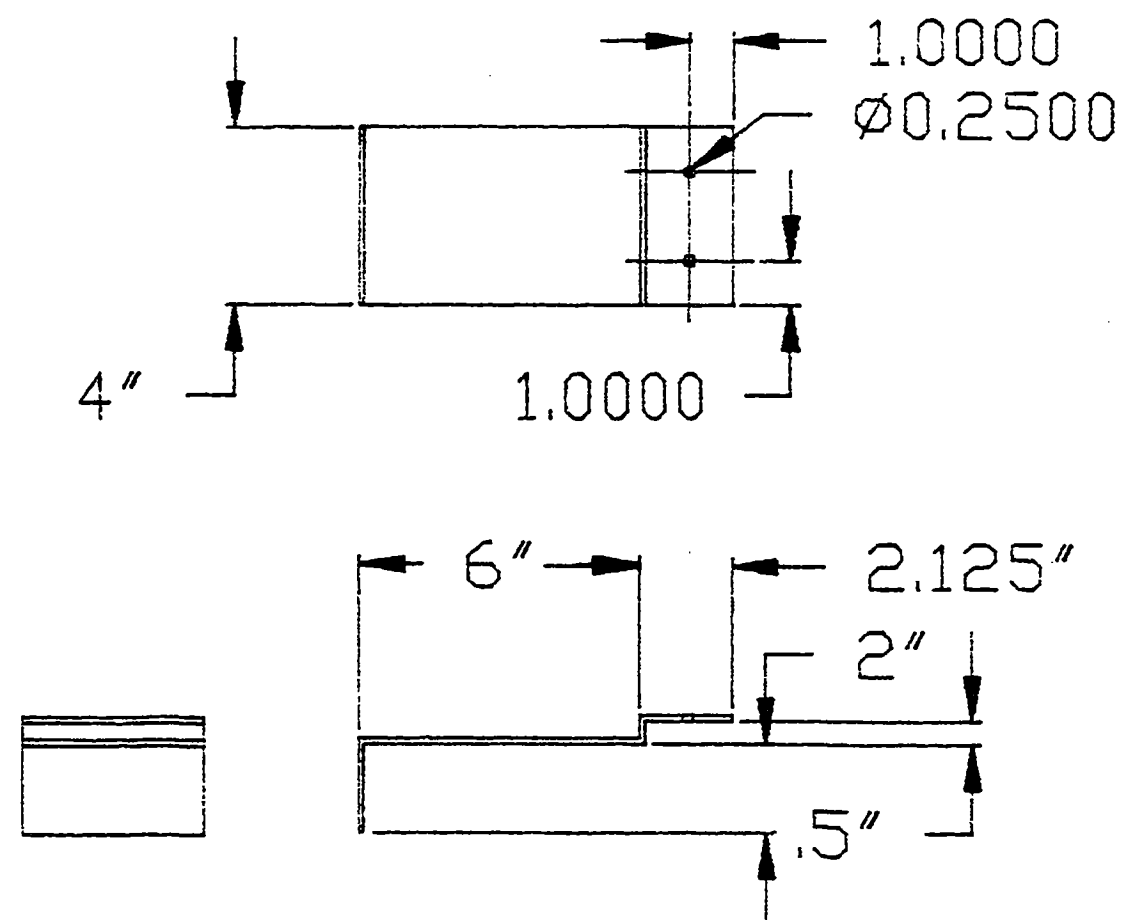
LIGHT FRAME
 MATERIAL
 ALUMINUM TUBING 1' X 2' X 0.125'
 6063-T52

STRATEGIC HIGHWAY RESEARCH PROGRAM	
PROJECT: DIVERGING LT.	
Contractor: Graham-Migletz Enterprises, Inc. Independence, Missouri	
PROJECT NO.:	ASST.
DATE:	1967-12-10
DESIGNED BY:	108-5-5A
CHECKED BY:	
APPROVED BY:	



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

[illegible]



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

REV	DATE	DESCRIPTION	BY	CHKD
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

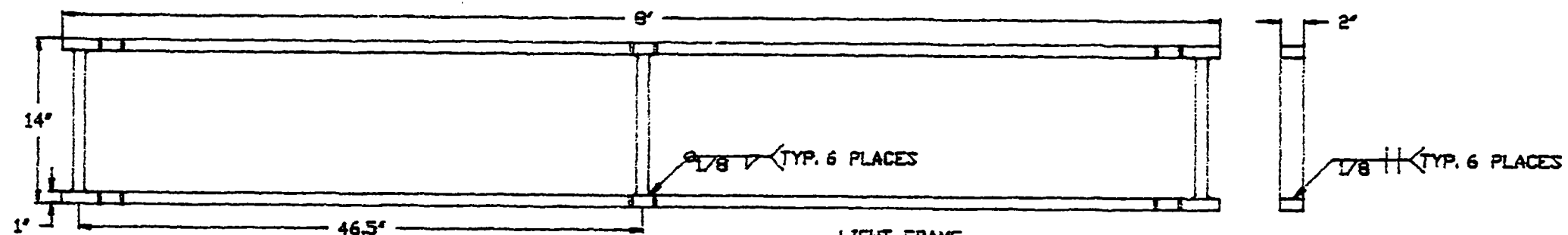


LIGHT BRACKET


MATERIAL

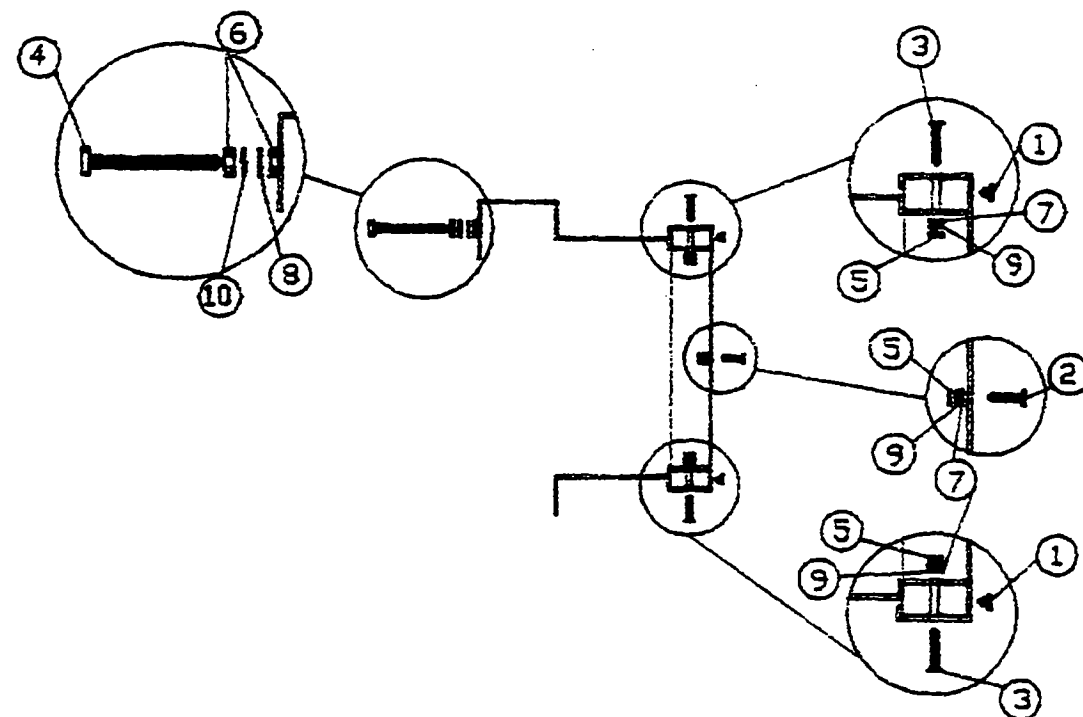
ALUMINUM SHEET 0.125" THICK

1100-H14



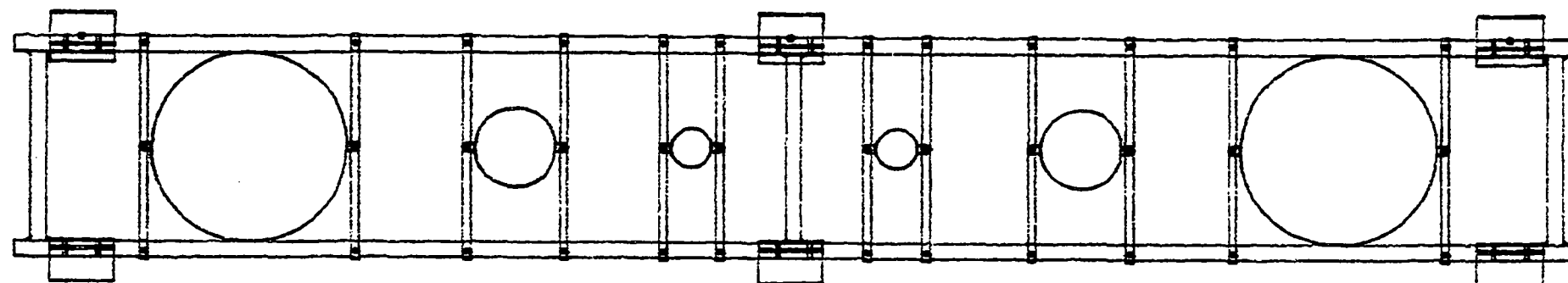
LIGHT FRAME
 MATERIAL
 ALUMINUM TUBING 1" X 2" X 0.125"
 6063-T52

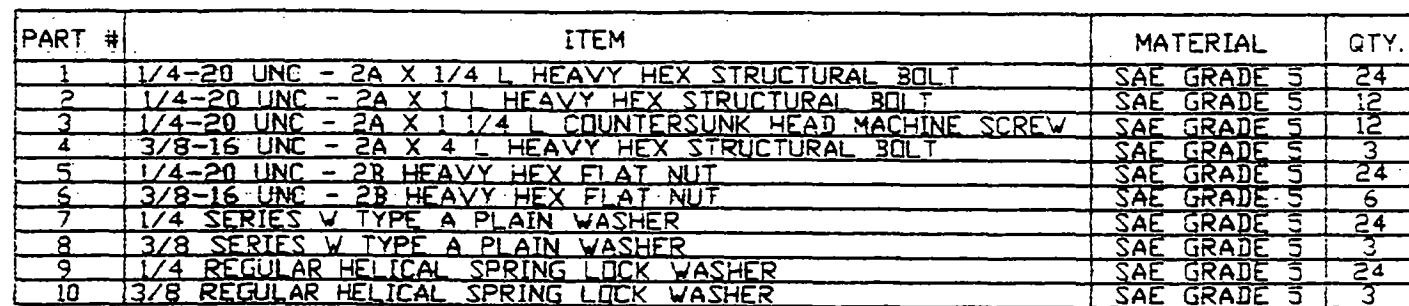
				 STANDARD UNIVERSAL MACHINERY PROGRAM			
				Griffin-Adams Engineering, Inc. Independence, Missouri			
				SHEET NO. 1 JOB NO. 1 DRAWING NO. 1			
				DATE: 10-1-68 BY: J. J. CHECKED: J. J. SCALE: 1" = 1'-0"			
				PROJECT: 10-1-68 SHEET NO. 1 JOB NO. 1 DRAWING NO. 1			



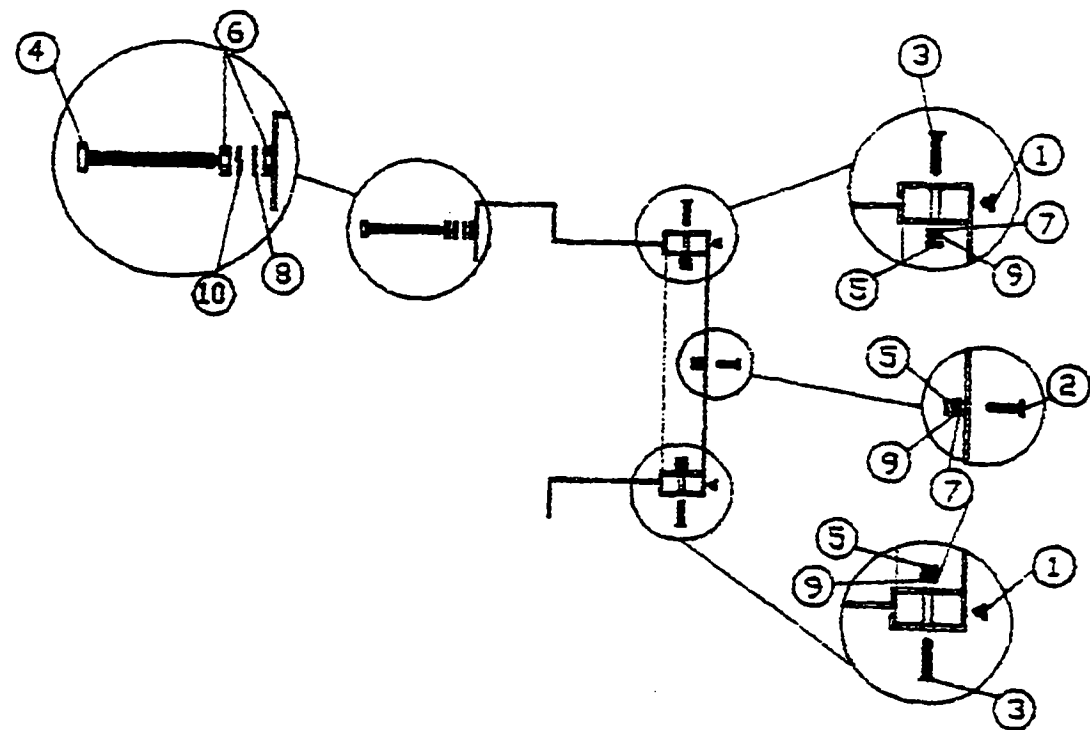
PART #	ITEM	MATERIAL	QTY.
1	1/4-20 UNC - 2A X 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	24
2	1/4-20 UNC - 2A X 1 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
3	1/4-20 UNC - 2A X 1 1/4 L COUNTERSUNK HEAD MACHINE SCREW	SAE GRADE 5	12
4	3/8-16 UNC - 2A X 4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	3
5	1/4-20 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

REVISIONS				CONTROLLED DOCUMENT MANAGEMENT PROGRAM			
REV.				REV.			
DATE				DATE			
BY				BY			
CHECKED				CHECKED			
APPROVED				APPROVED			
SIGNATURE				SIGNATURE			
TITLE				TITLE			
DEPT.				DEPT.			
MATERIALS				MATERIALS			
EQUIPMENT				EQUIPMENT			
TOOLING				TOOLING			
FABRICATION				FABRICATION			
FINISHING				FINISHING			
INVENTORY				INVENTORY			
REWORK				REWORK			
SCRAP				SCRAP			
WASTE				WASTE			
RECYCLING				RECYCLING			
DISPOSAL				DISPOSAL			

[illegible]

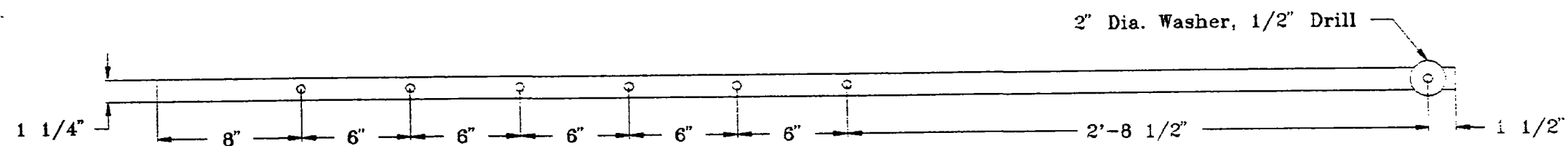


12 of 14

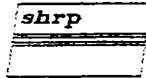
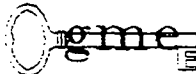


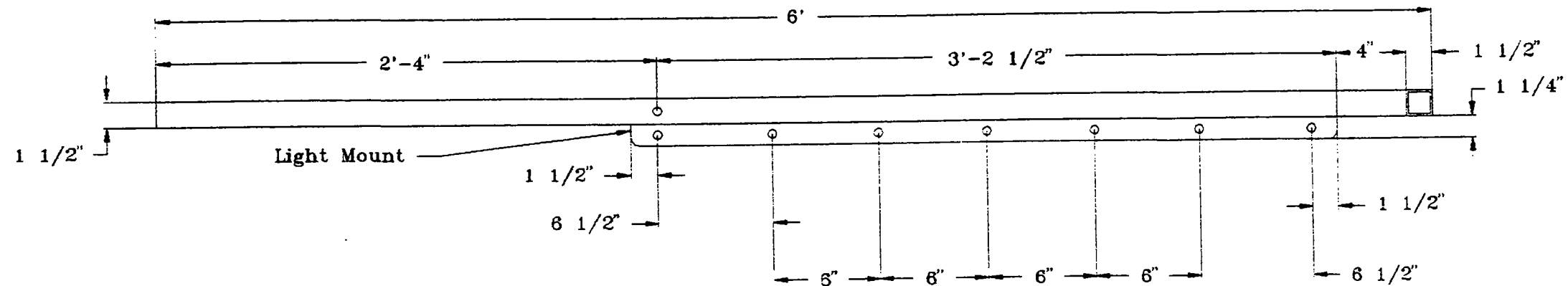
PART #	ITEM	MATERIAL	QTY.
1	1/4-20 UNC - 2A X 1 1/4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	24
2	1/4-20 UNC - 2A X 1 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	12
3	1/4-20 UNC - 2A X 1 1/4 L COUNTERSUNK HEAD MACHINE SCREW	SAE GRADE 5	12
4	3/8-16 UNC - 2A X 4 L HEAVY HEX STRUCTURAL BOLT	SAE GRADE 5	3
5	1/4-20 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 V TYPE A PLAIN WASHER	SAE GRADE 5	24
8	3/8 SERIES V 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

REVISIONS				APPROVED			
REV.	DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY	DATE

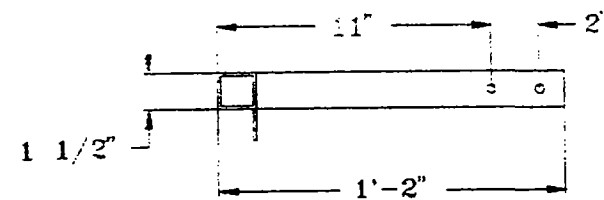


Internal Extension Tube
 Typical of Both Sides
 All Holes This View 1/2" Dia.
 Material is 1/8" Steel

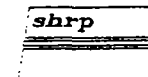
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: Maintenance Vehicle Floodlight	DRAWN BY: JMM REVISED: ---
ASSEMBLY: N/A	SCALE: None
DRAWING NUMBER: 1 of 7	DATE: 8-26-92



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



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

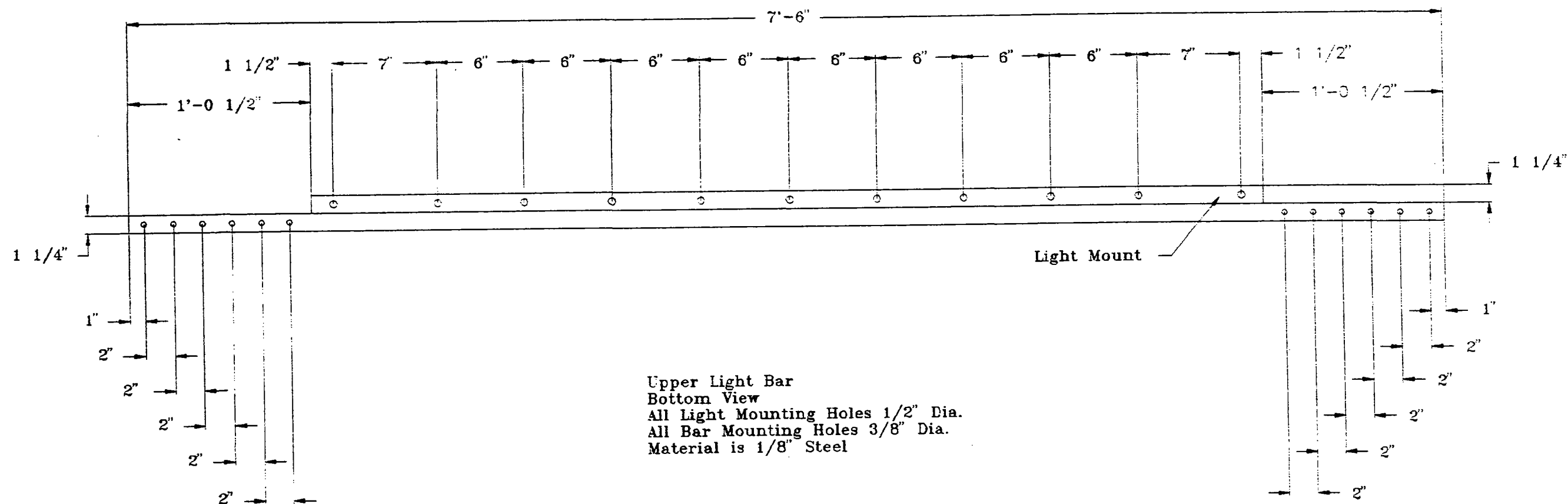
REVISED: ---

ASSEMBLY: N/A

SCALE: None

DRAWING NUMBER: 2 of 7

DATE: 8-26-92



shrp

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

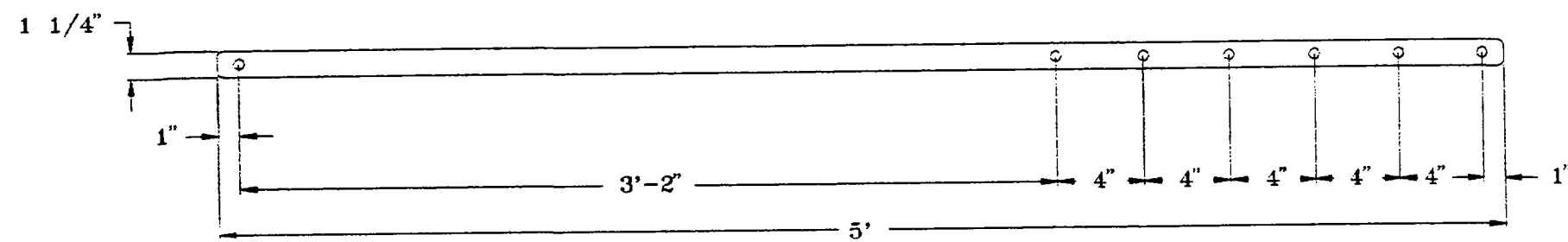
P.O. Box 348
Independence, Missouri 64050

TITLE: Maintenance Vehicle Floodlight


REVISÉ: — — —

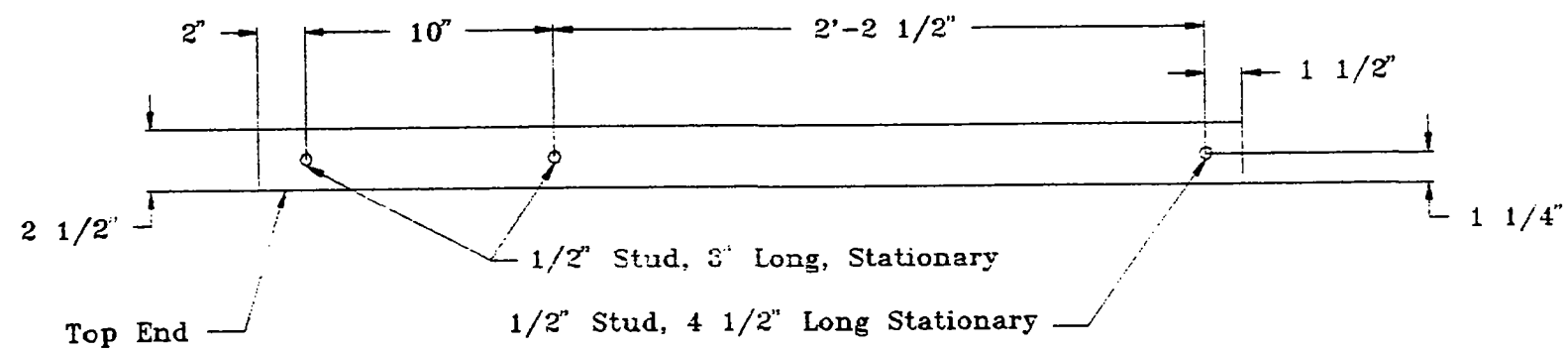
ASSEMBLY: N/A

DRAWING NUMBER: 3 of 7


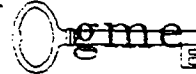


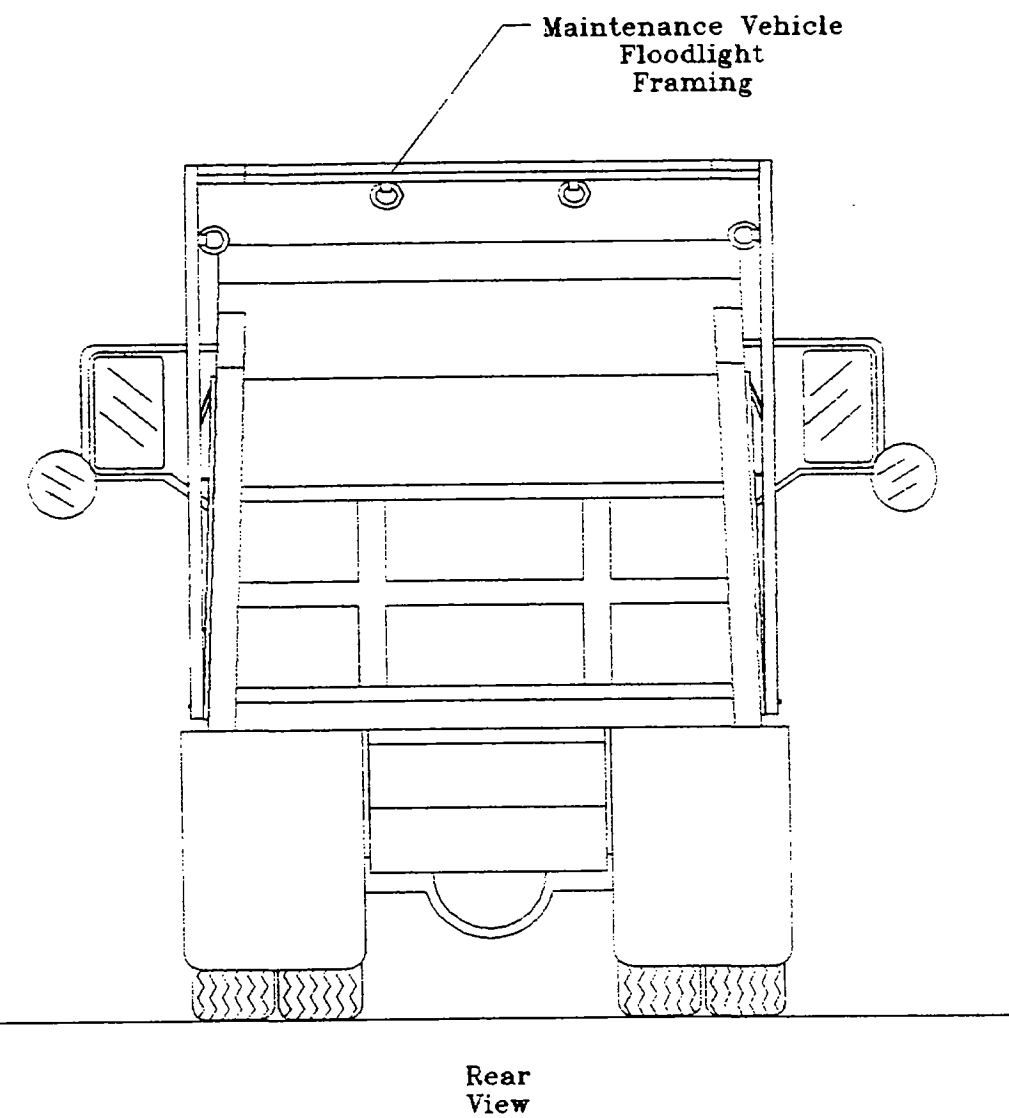
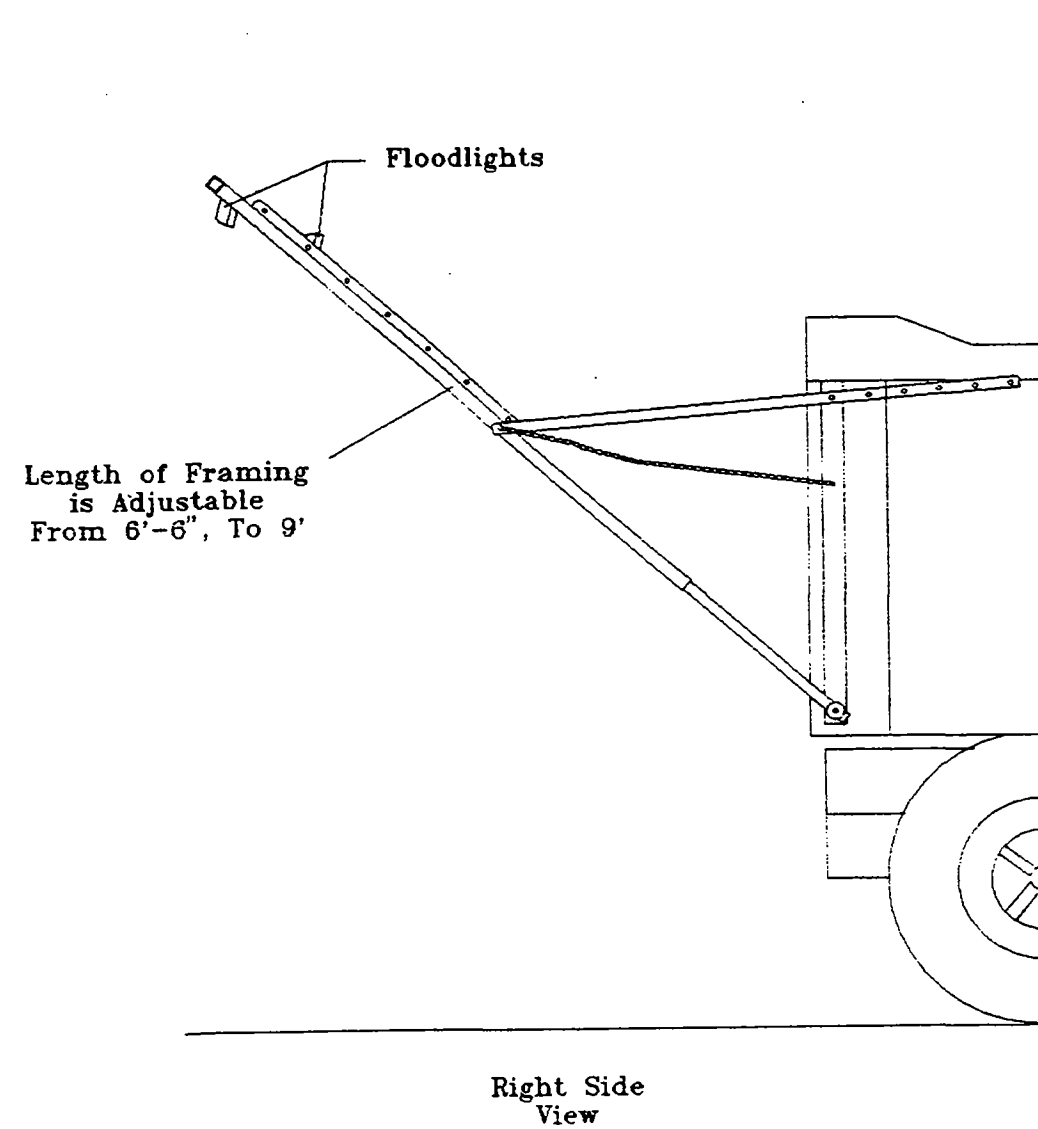
Mounting Strap
 Typical of Both Sides
 Material is 1/8" Steel
 (A 5'-6" Chain is Recommended as a Safety Back up)

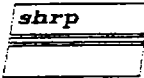
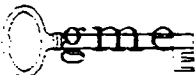
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
(816) 254-1788 FAX (816) 254-4654	
TITLE: Maintenance Vehicle Floodlight	DRAWN BY: JMM
ASSEMBLY: N/A	REVISED: ---
DRAWING NUMBER: 4 of 7	SCALE: None
DATE: 8-26-92	DATE: 8-26-92

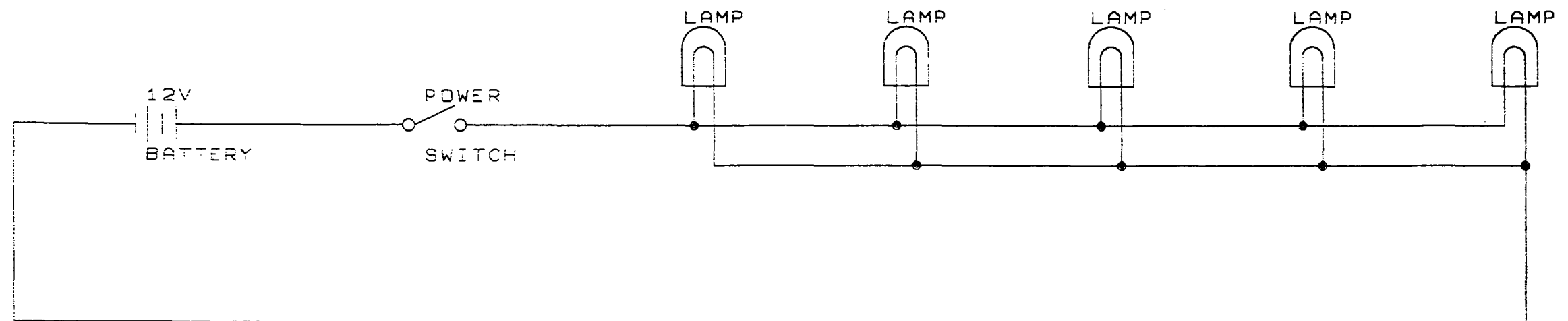


Truck Mount
 Material is 1/2" Steel
 Layout Typical of Both Sides
 Mount Welded to Sides of Truck Bed

 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
Maintenance Vehicle Floodlight	REVISED: ---
ASSEMBLY: N/A	SCALE: None
DRAWING NUMBER: 5 of 7	DATE: 8-26-92



	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
ASSEMBLY: Truck Mount		SCALE: None
DRAWING NUMBER: 6 of 7		DATE: 8-26-92



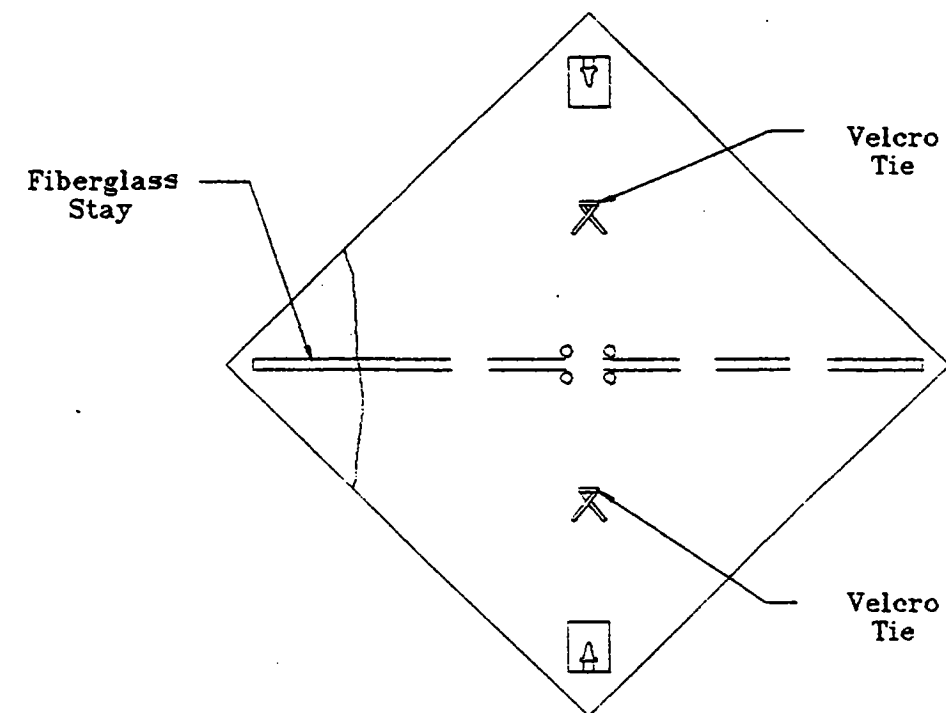
STRATEGIC HIGHWAY RESEARCH PROGRAM

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

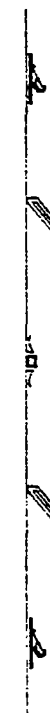


(816) 254-1788
FAX (816) 254-4654

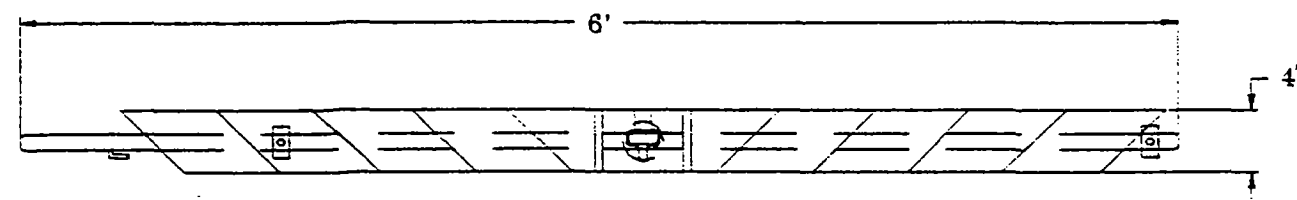
TITLE:	DRAWN BY: BBF
MAINTENANCE VEHICLE FLOOD LIGHT	REVISED: BEF
ASSEMBLY: ELECTRICAL PLANS	SCALE: NONE
DRAWING NUMBER: 7 OF 7	DATE: 10-8-92



Front View



Side View



Top View

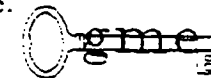


STRATEGIC HIGHWAY RESEARCH PROGRAM

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

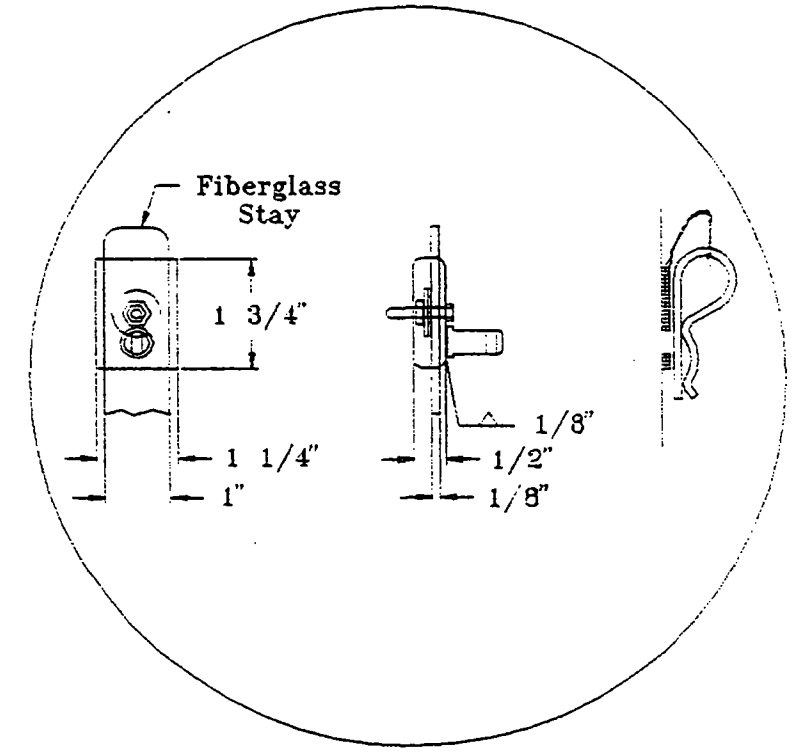
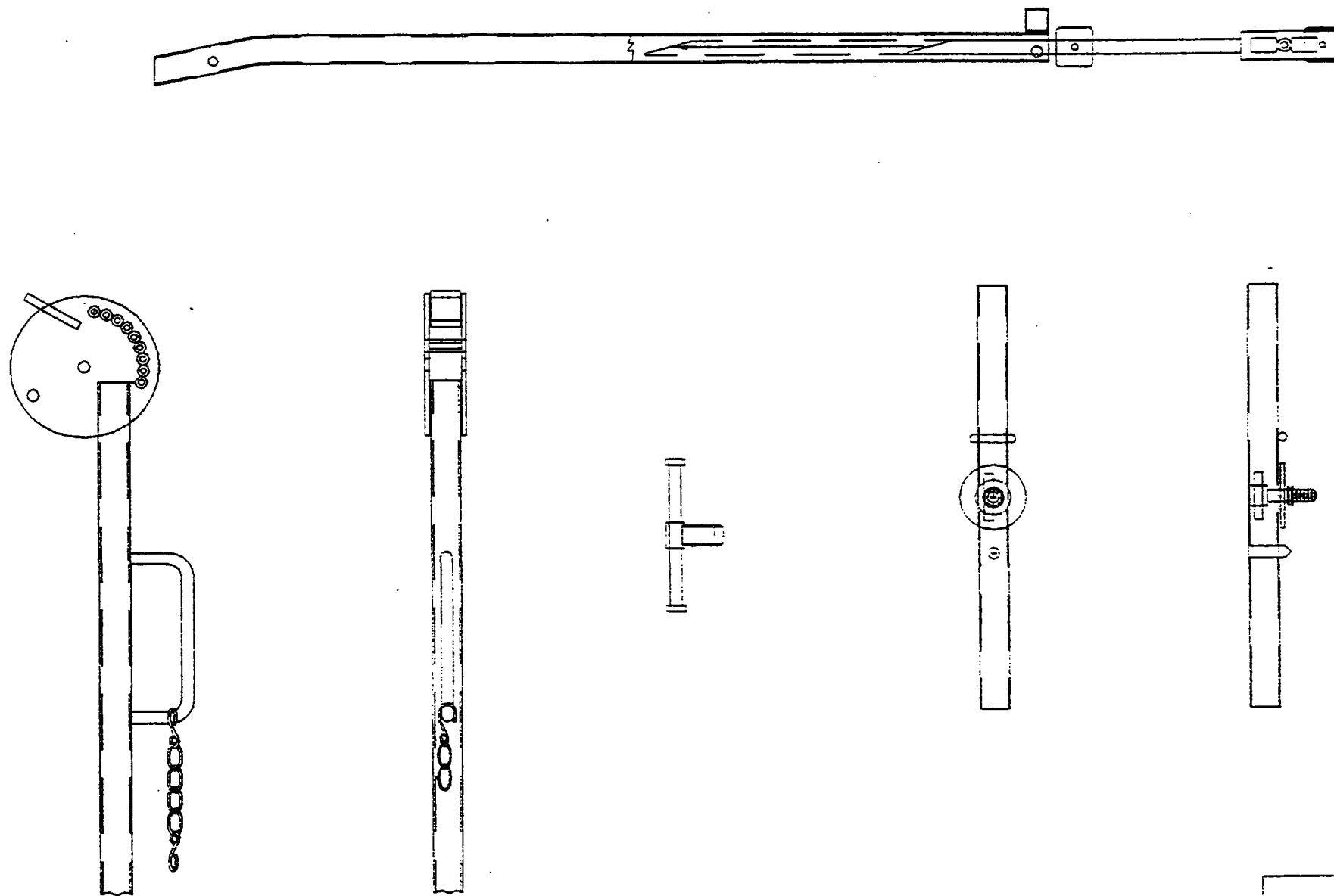
REVISED: ---

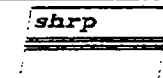
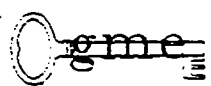
ASSEMBLY: N/A

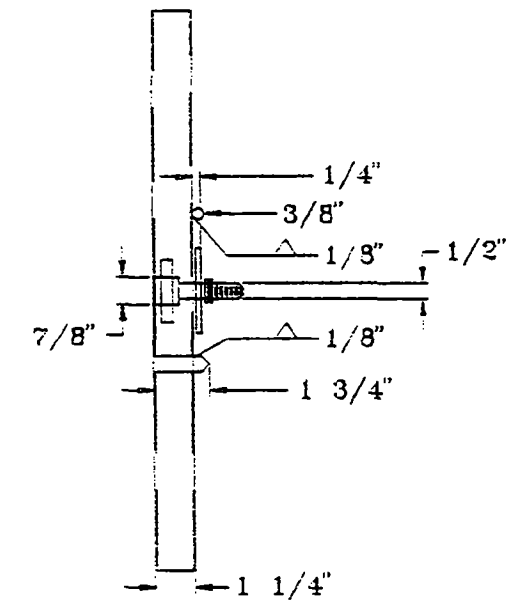
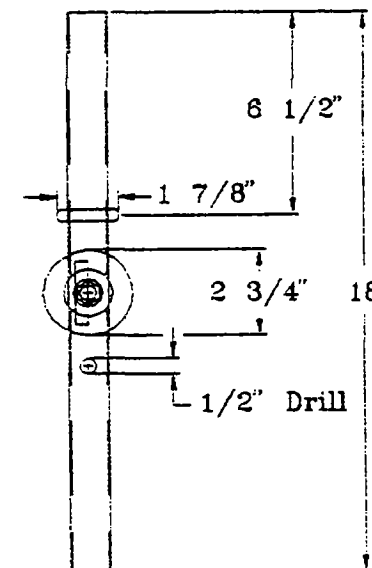
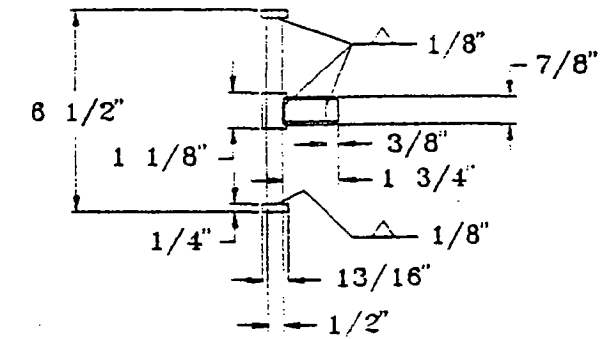
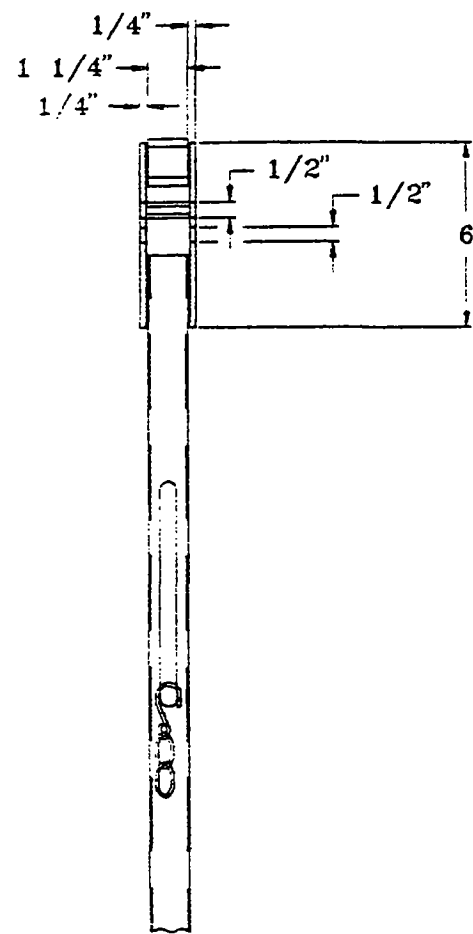
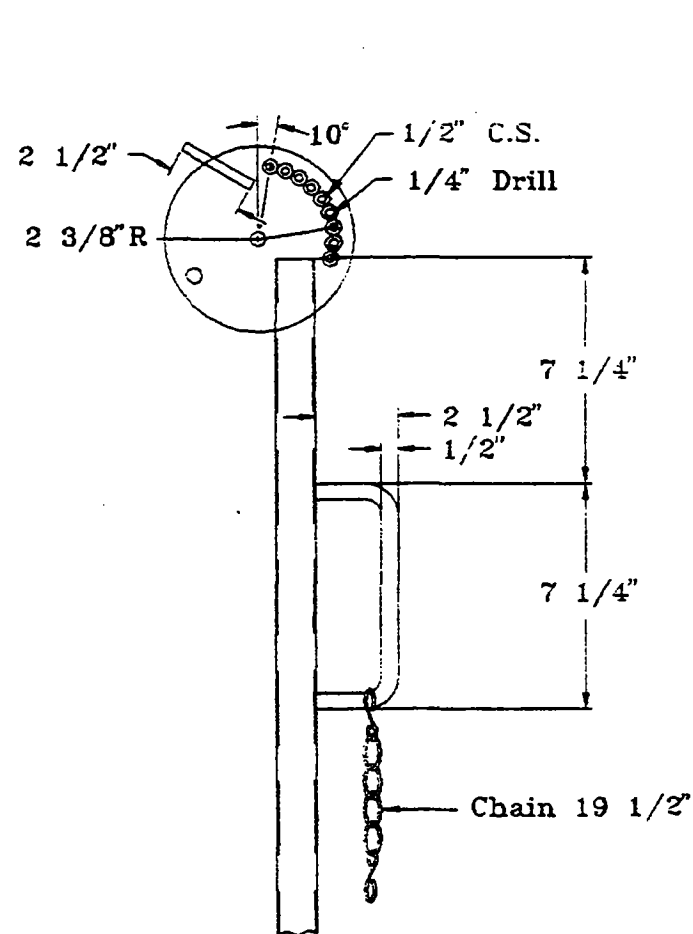
SCALE: None

DRAWING NUMBER: 1 of 6

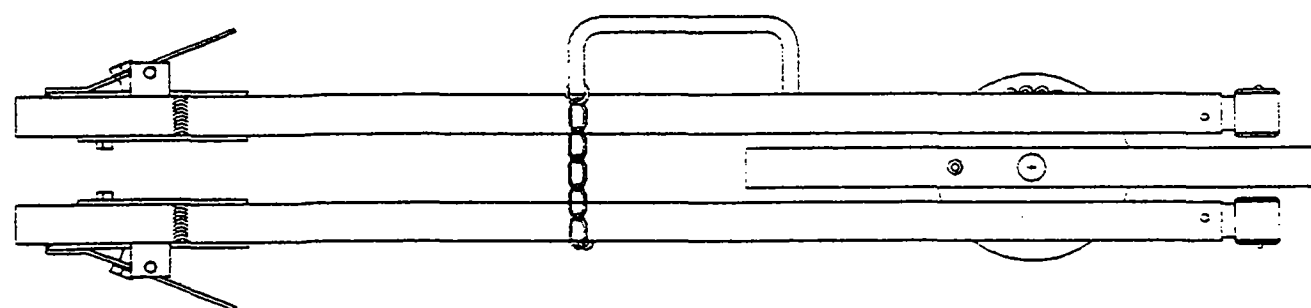
DATE: 8-25-92




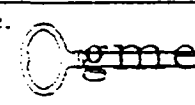
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: Portable Sign and Stand	DRAWN BY: JMM
ASSEMBLY: N/A	REVISION: ---
DRAWING NUMBER: 2 of 6	DATE: 8-25-92

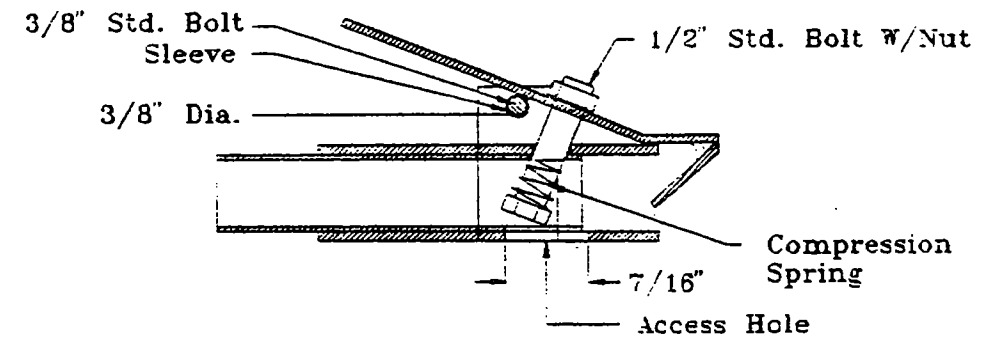
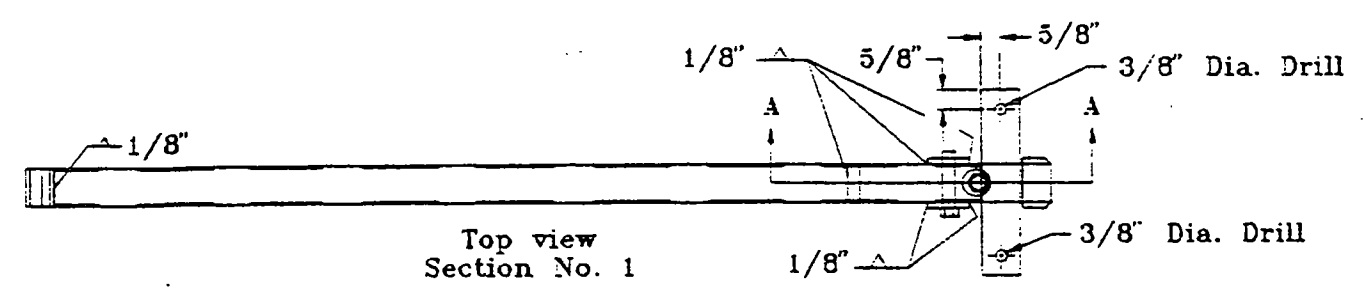
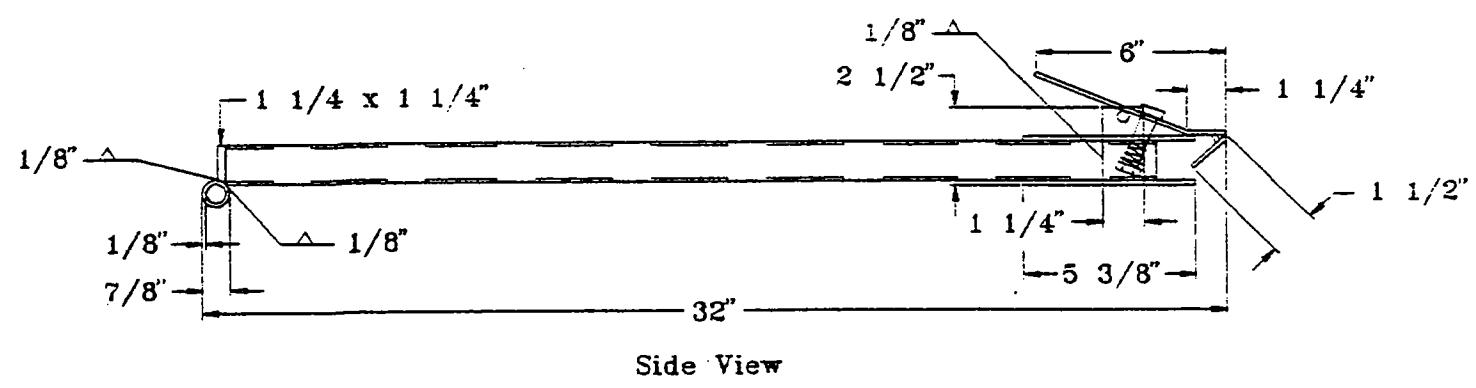
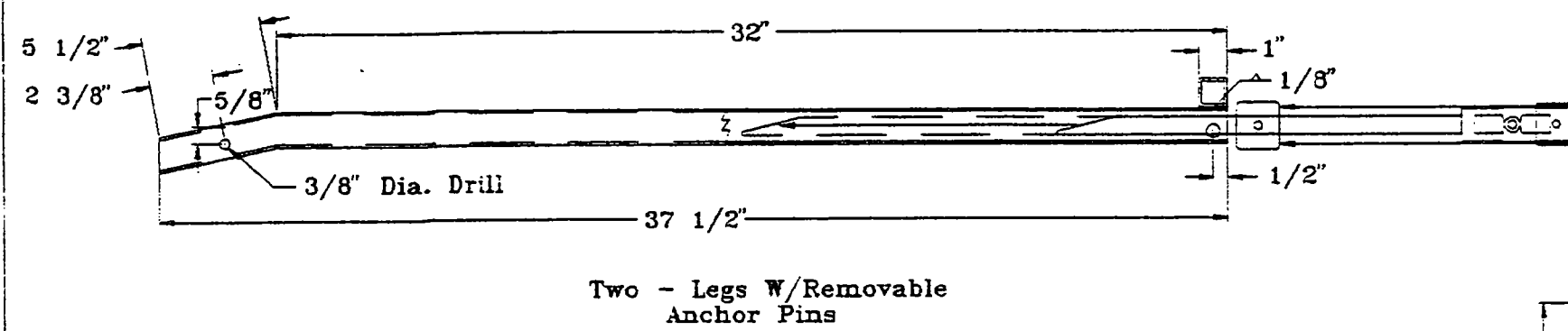
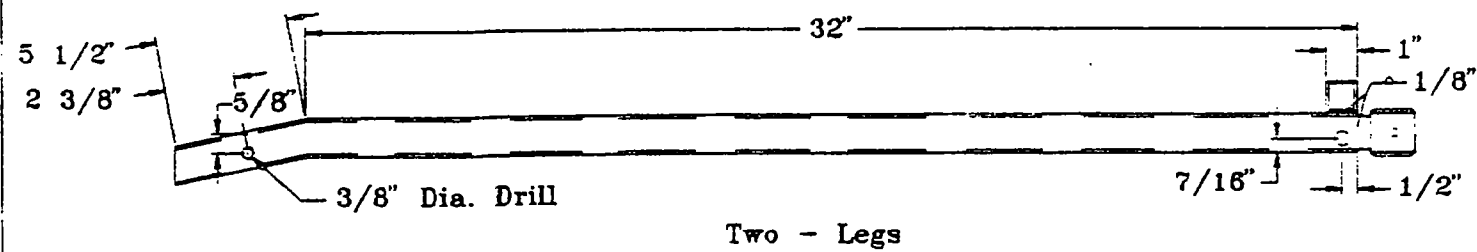


End Same as Section No.1

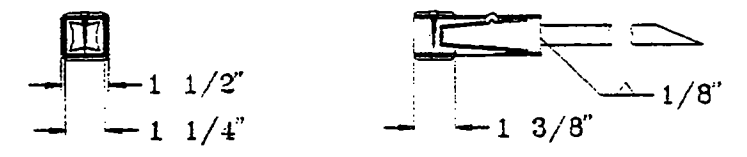


Leg's Folded Up

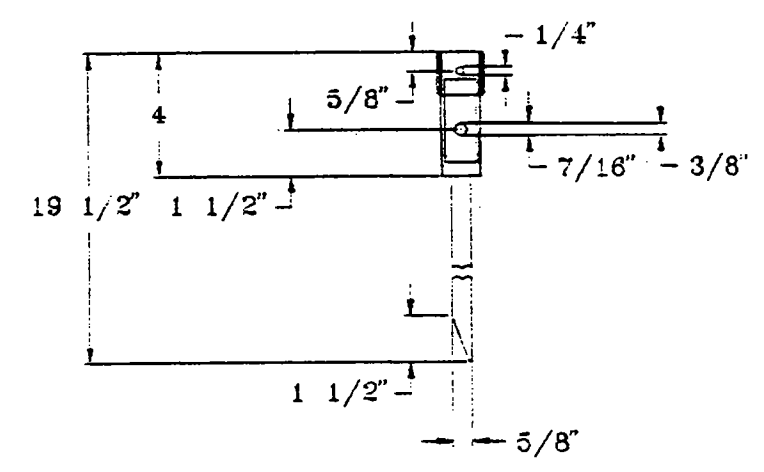
	STRATEGIC HIGHWAY RESEARCH PROGRAM
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	 (816) 254-1788 FAX (816) 254-4654
TITLE: Portrable Sign and Stand	DRAWN BY: JMM REVISED: ---
ASSEMBLY: N/A	SCALE: None
DRAWING NUMBER: 3 of 6	DATE: 8-25-92

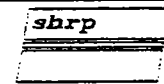



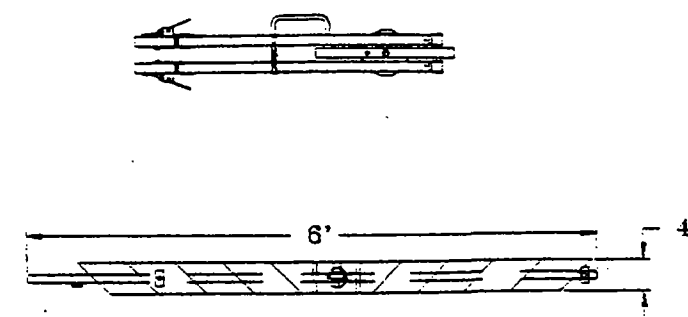
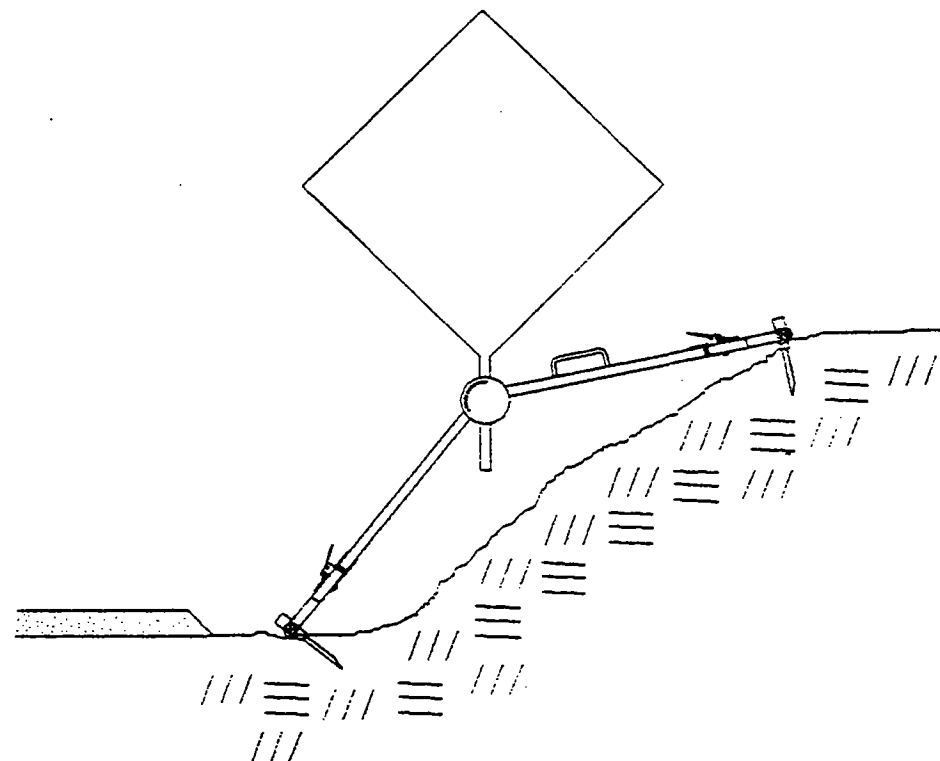
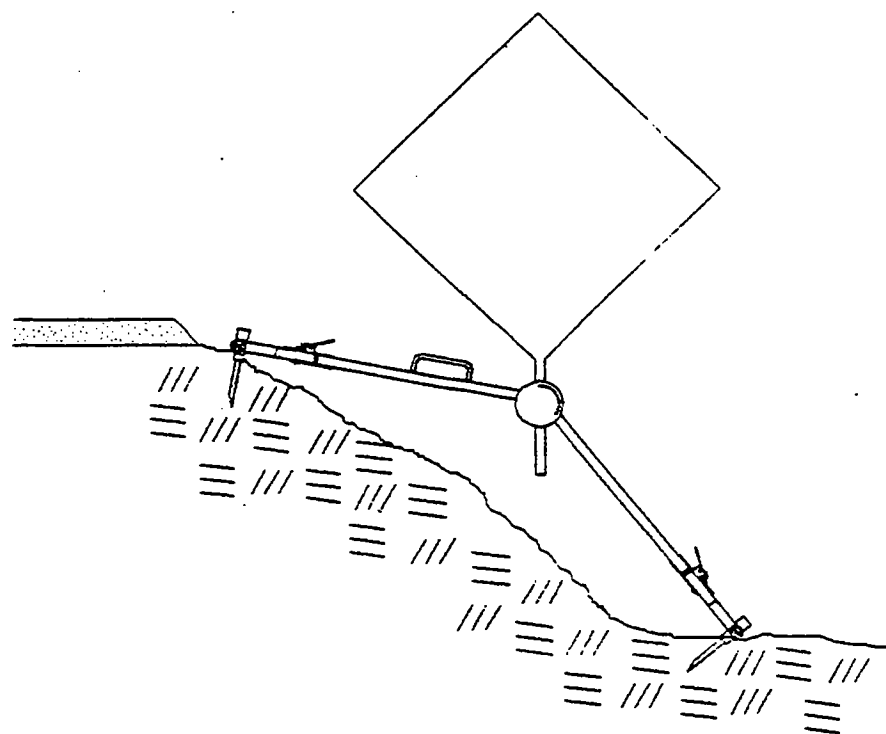
Sec. A-A



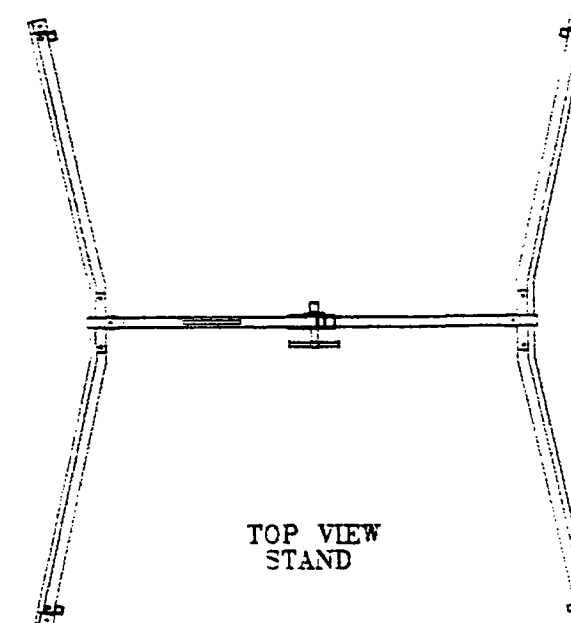
Anchor Pin



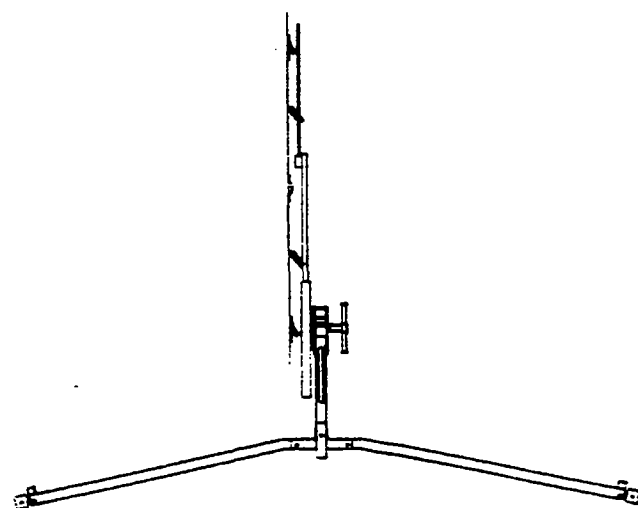
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: Portable Sign and Stand	DRAWN BY: JMM
ASSEMBLY: N/A	REVISED: ---
DRAWING NUMBER: 4 of 6	SCALE: None
	DATE: 8-25-92



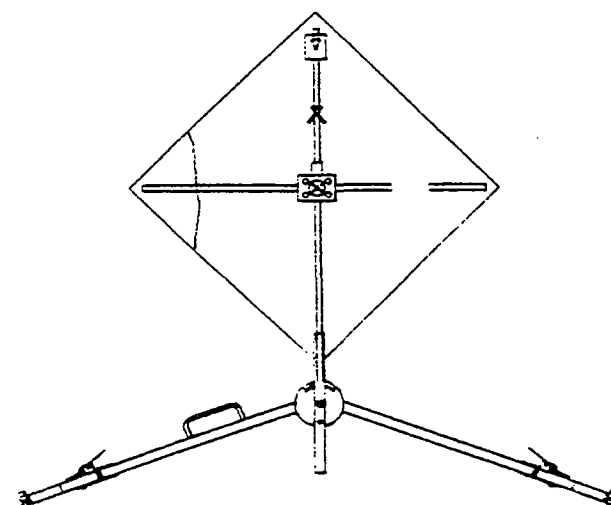
SCALE 1/32"=1'



TOP VIEW
STAND



Side View



Front 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: Portable Sign and Stand

DRAWN BY: JMM

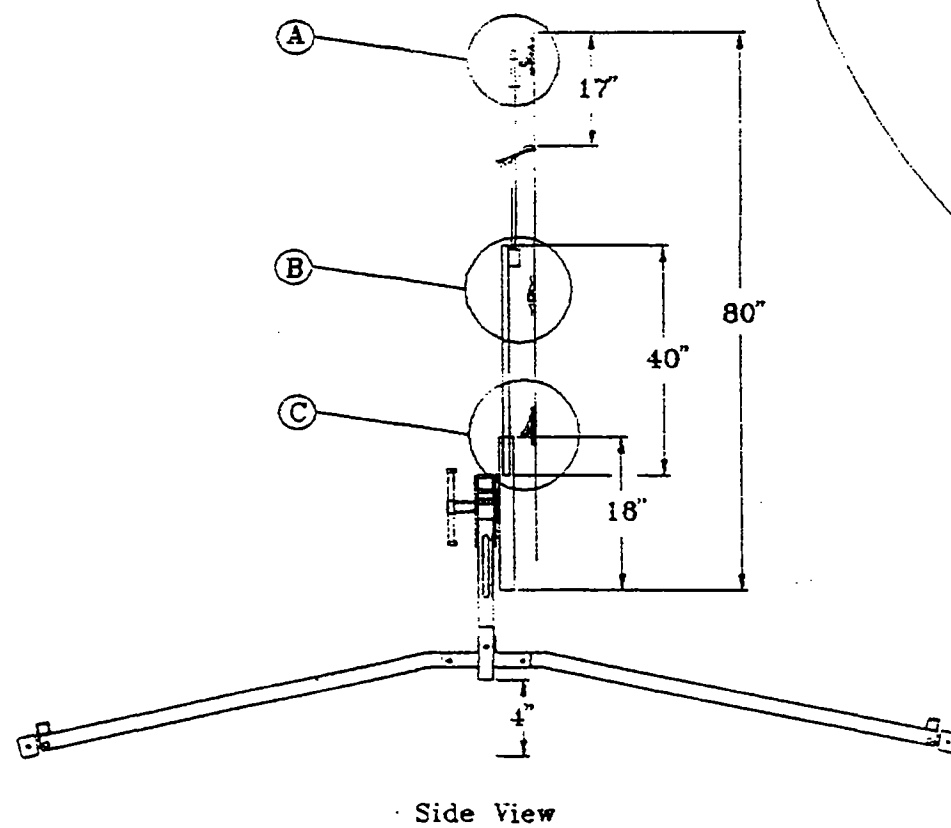
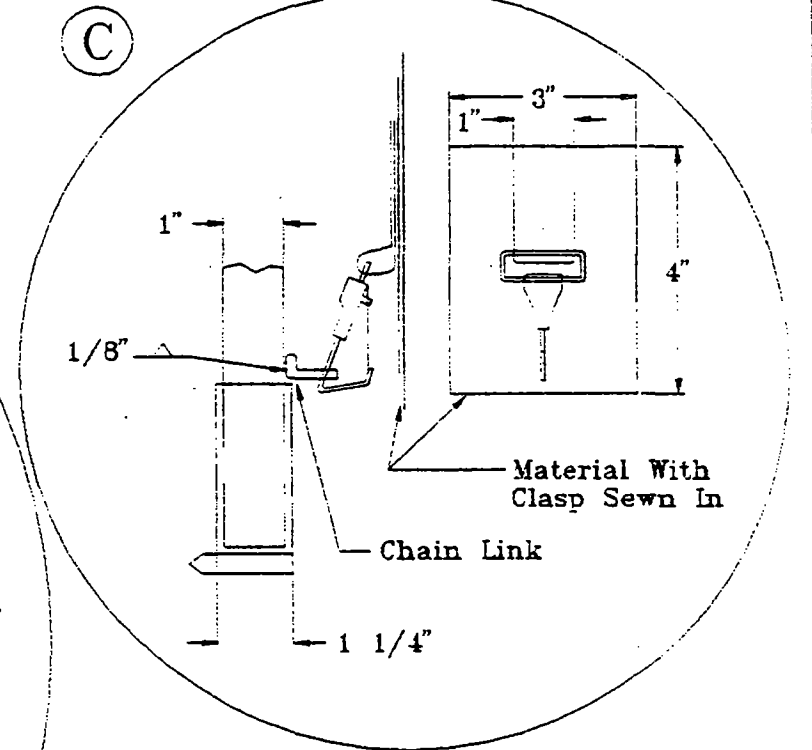
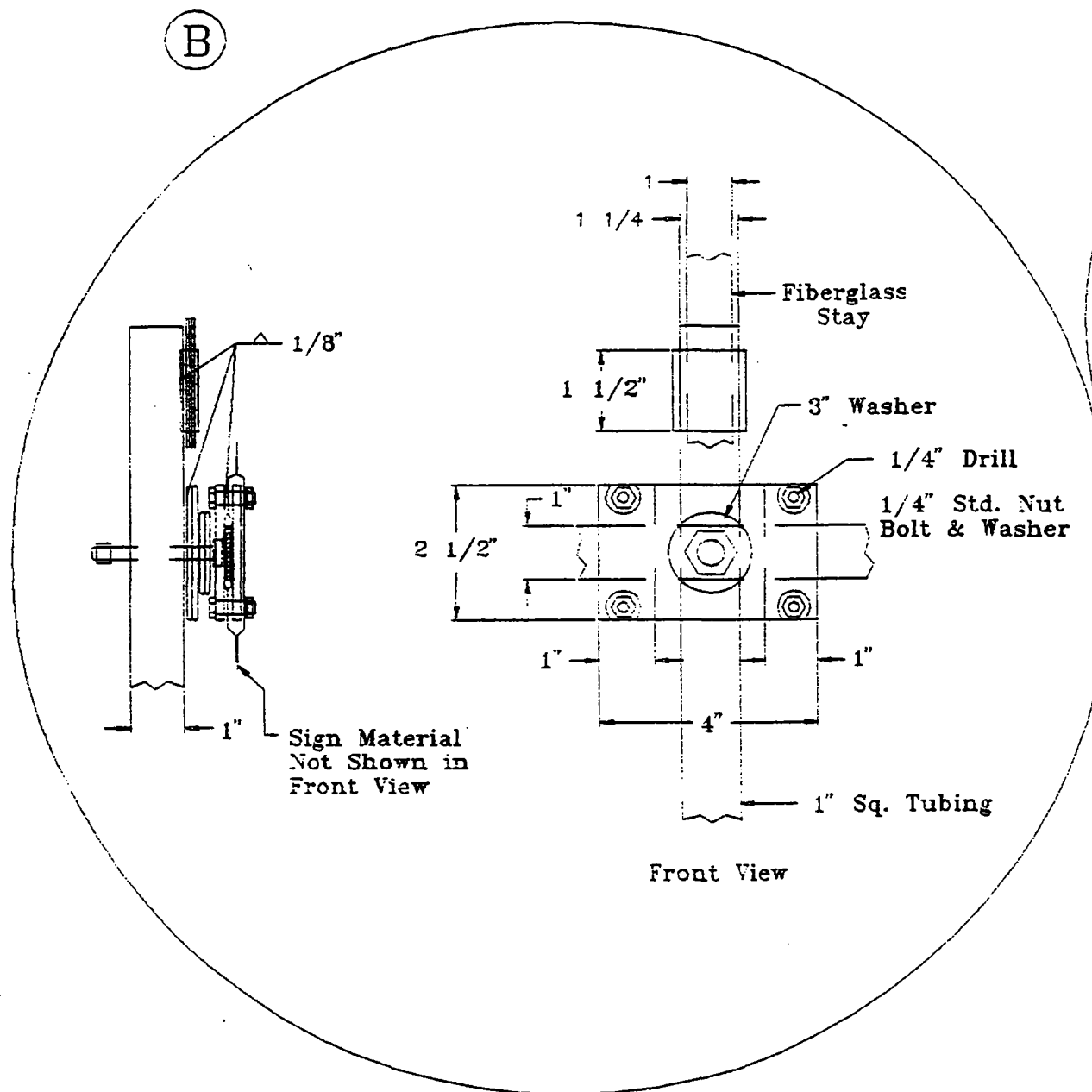
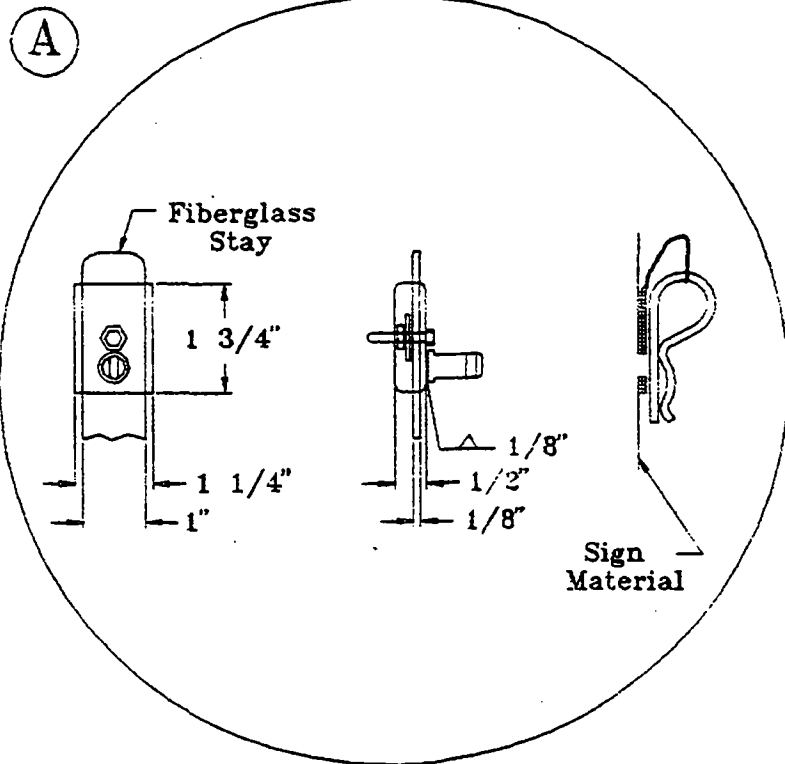
REVISED: ---


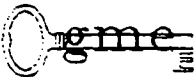
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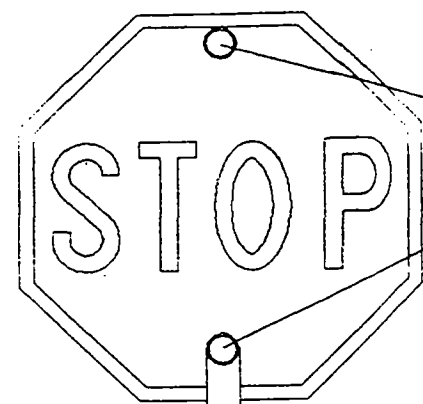
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DRAWING NUMBER: 5 of 6

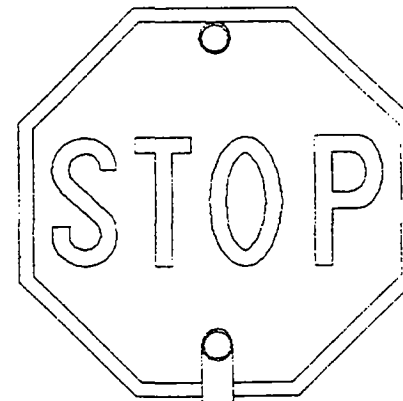
DATE: 8-25-92



 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: 6 of 6	SCALE: None
	DATE: 8-25-92



Quartz
Halogen
Lamps



B.



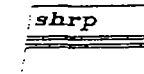
C.



D.

A.

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

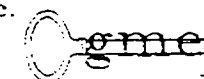


STRATEGIC HIGHWAY RESEARCH PROGRAM

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

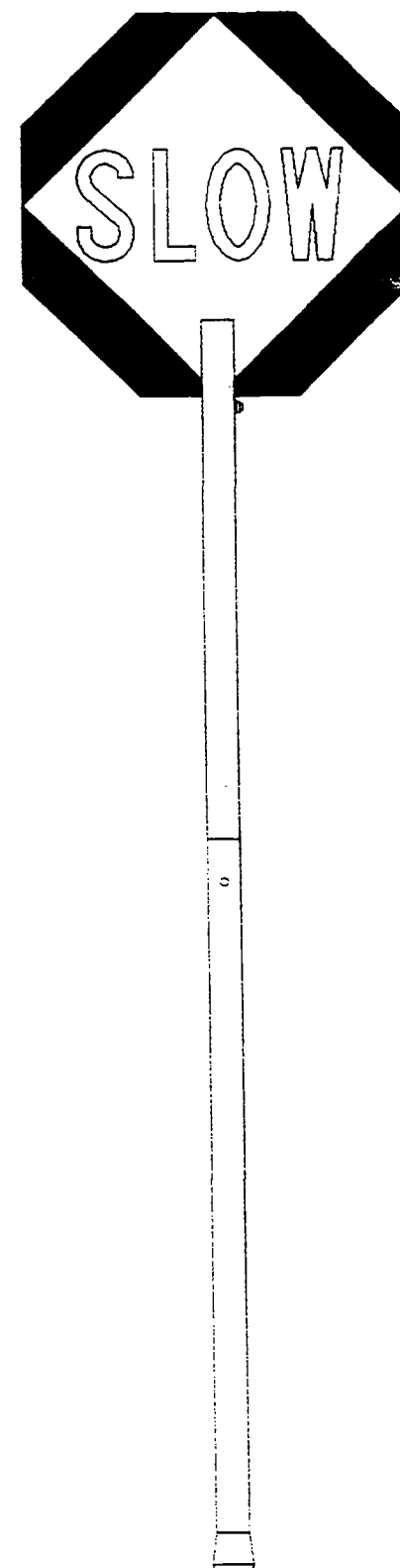
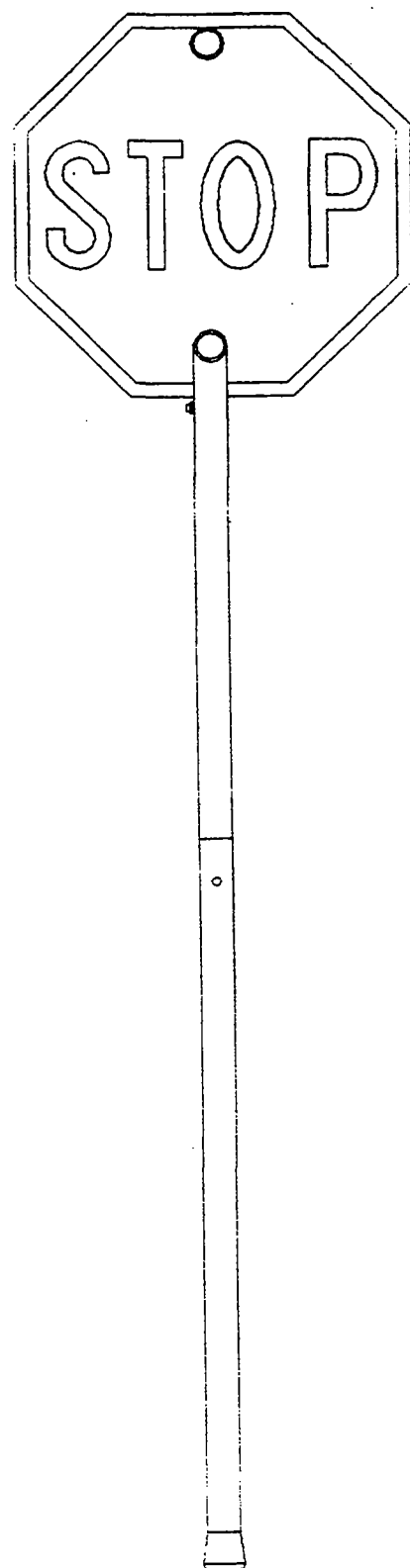
REVISED: ---

ASSEMBLY: N/A

SCALE: None

DRAWING NUMBER: 1 of 2

DATE: 8-25-92



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

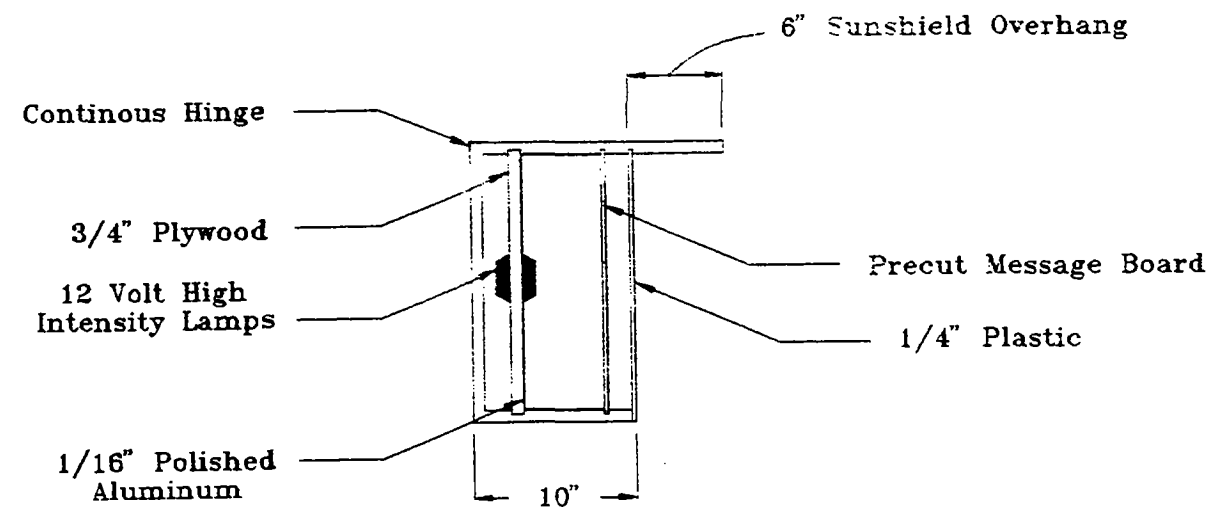
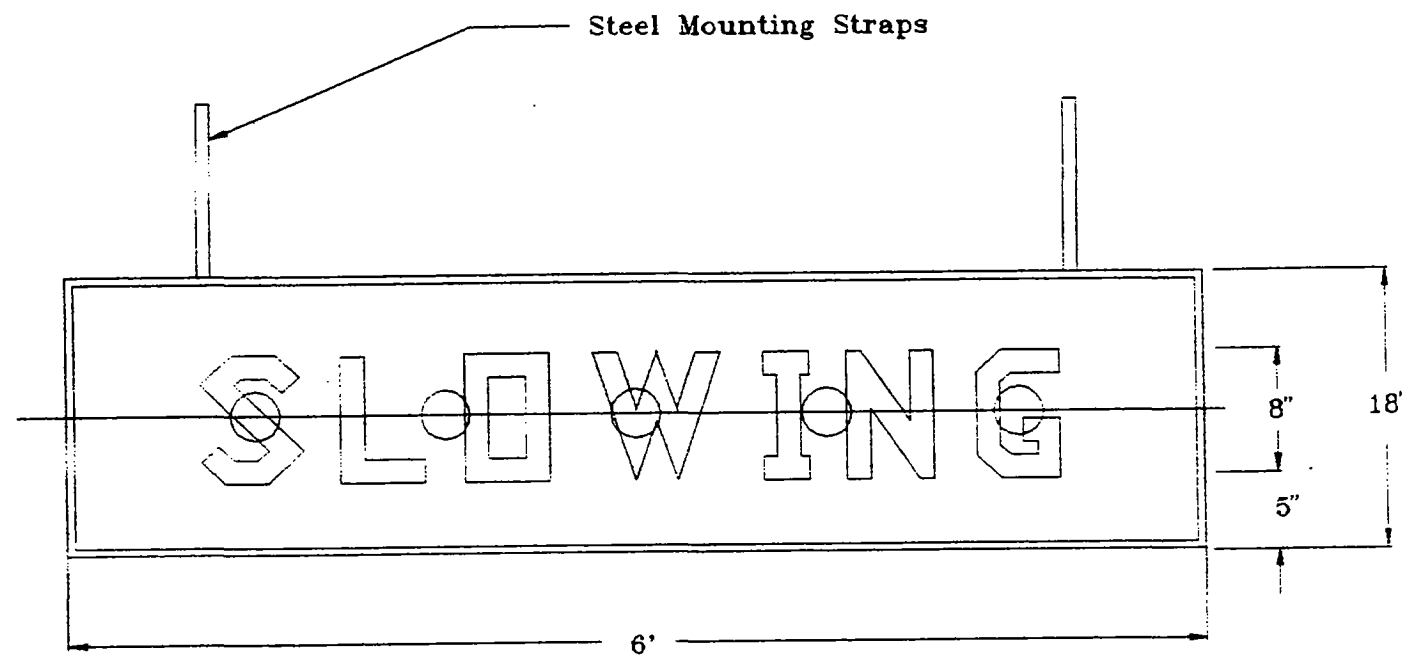
REVISED: ---

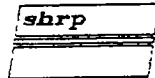

ASSEMBLY: Front/Back

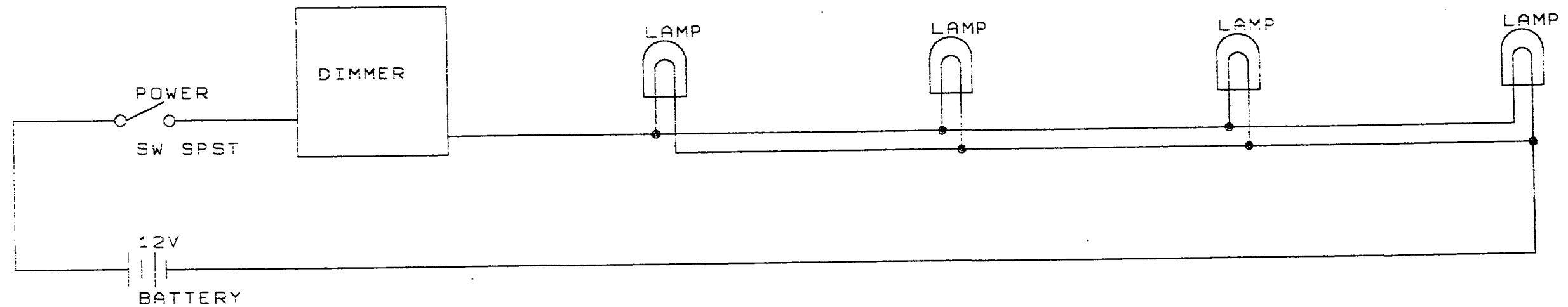
SCALE: None

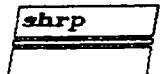

DRAWING NUMBER: 2 of 2

DATE: 8-25-92

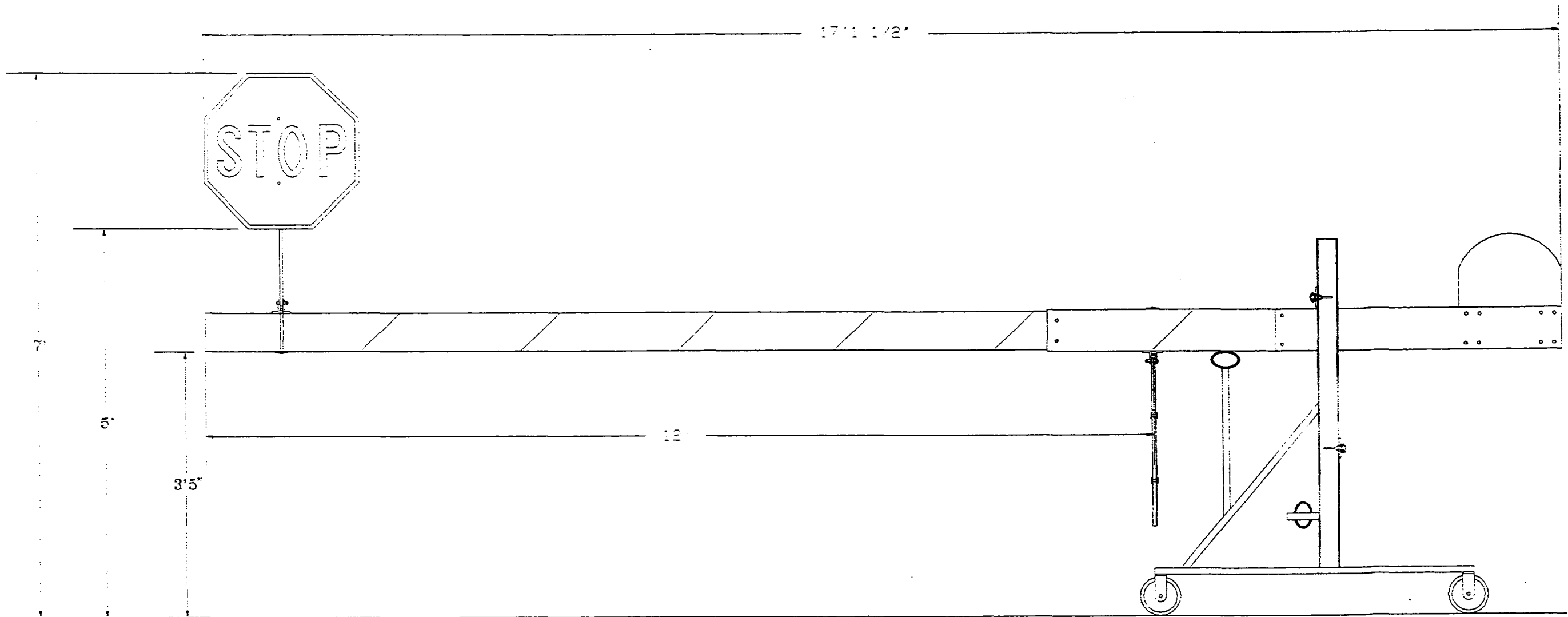


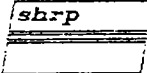

 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE: Truck Mounted Message Box	DRAWN BY: JMM
ASSEMBLY: N/A	REVISED: ---
DRAWING NUMBER: 1 of 2	SCALE: None
	DATE: 8-25-92

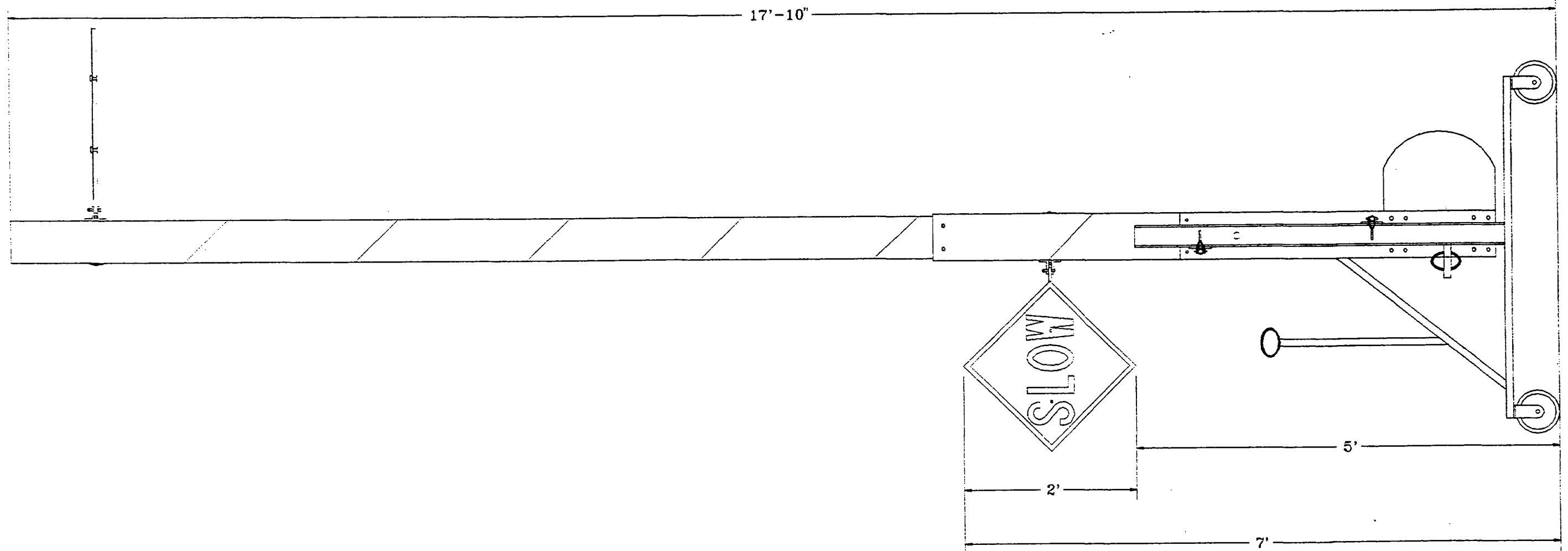



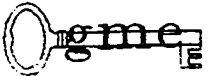
 STRATEGIC HIGHWAY RESEARCH PROGRAM	
Graham-Migletz Enterprises, Inc. P.O. Box 348 Independence, Missouri 64050	
 (816) 254-1788 FAX (816) 254-4654	
TITLE:	TRUCK MOUNTED MESSAGE BOX
ASSEMBLY:	ELECTRICAL PLANS
DRAWING NUMBER:	2 OF 2
DRAWN BY:	BBF
REVISED:	BBF
SCALE:	NONE
DATE:	10-20-92

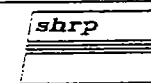
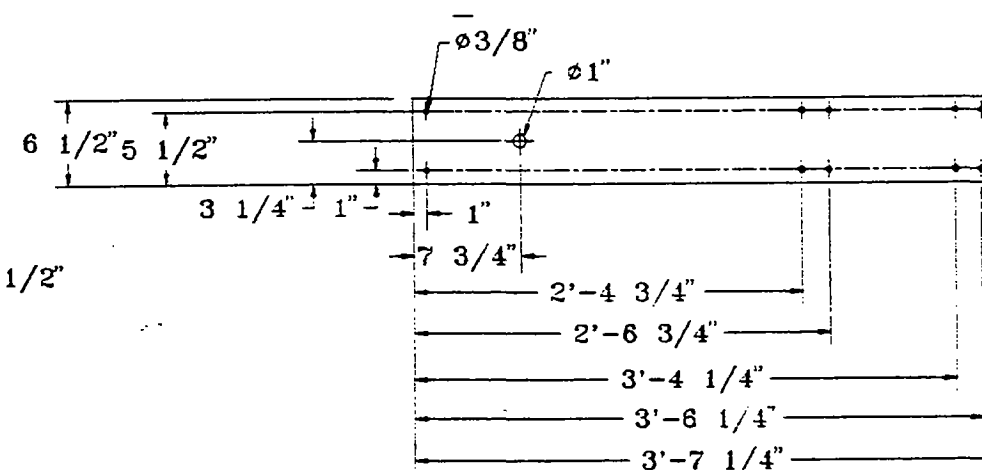
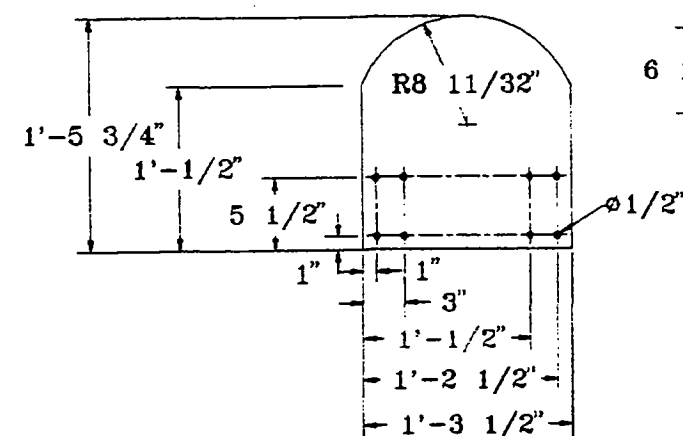
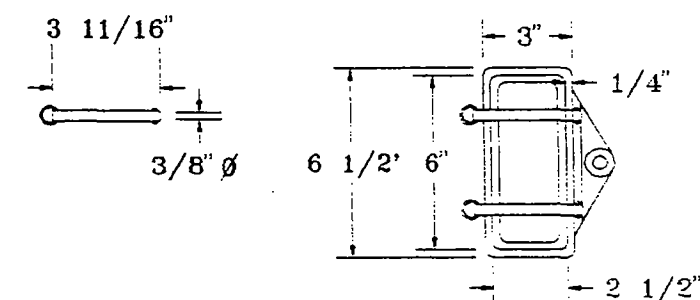
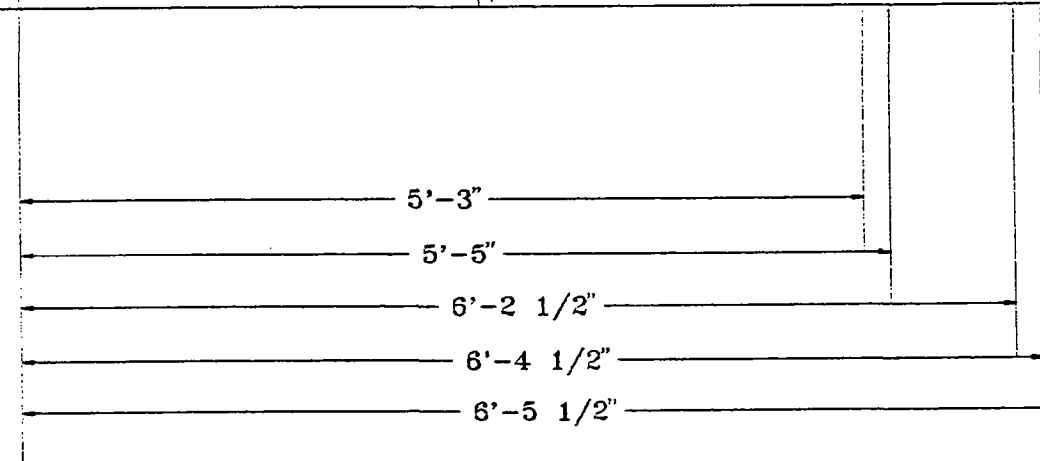
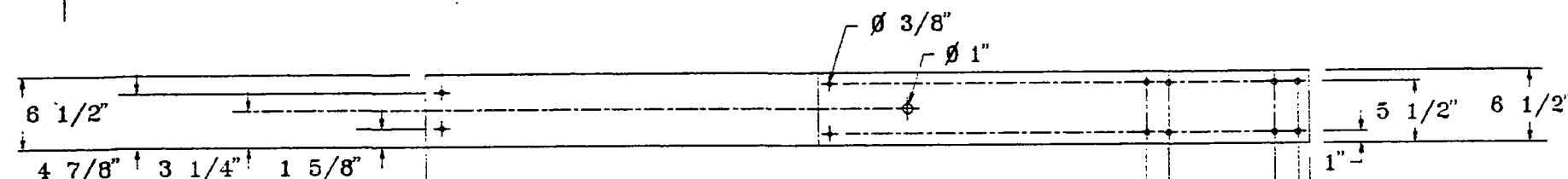
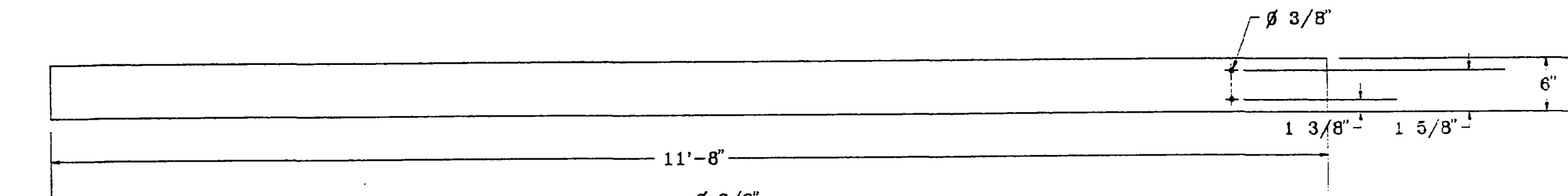
FLAGGER GATE



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



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



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

TITLE: ARM & WEIGHT

DRAWN BY: JMM

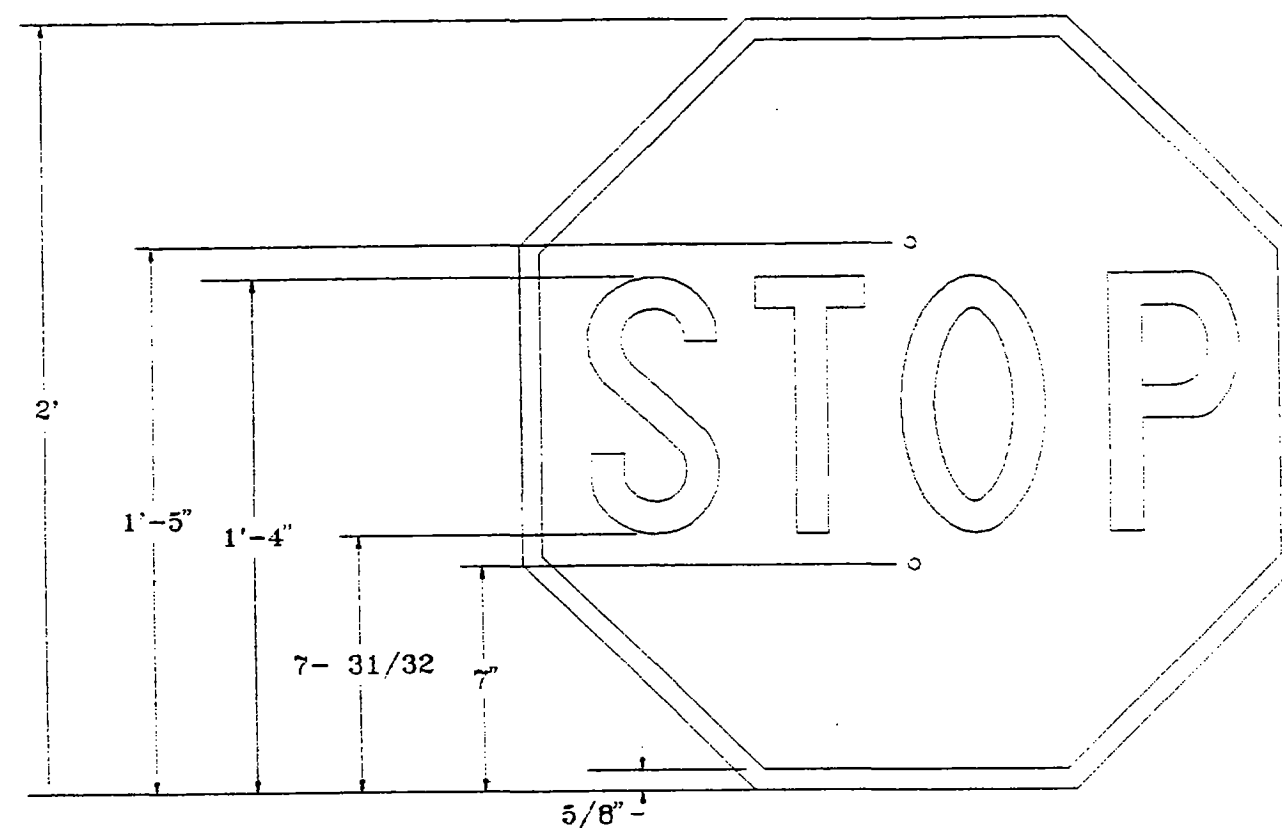
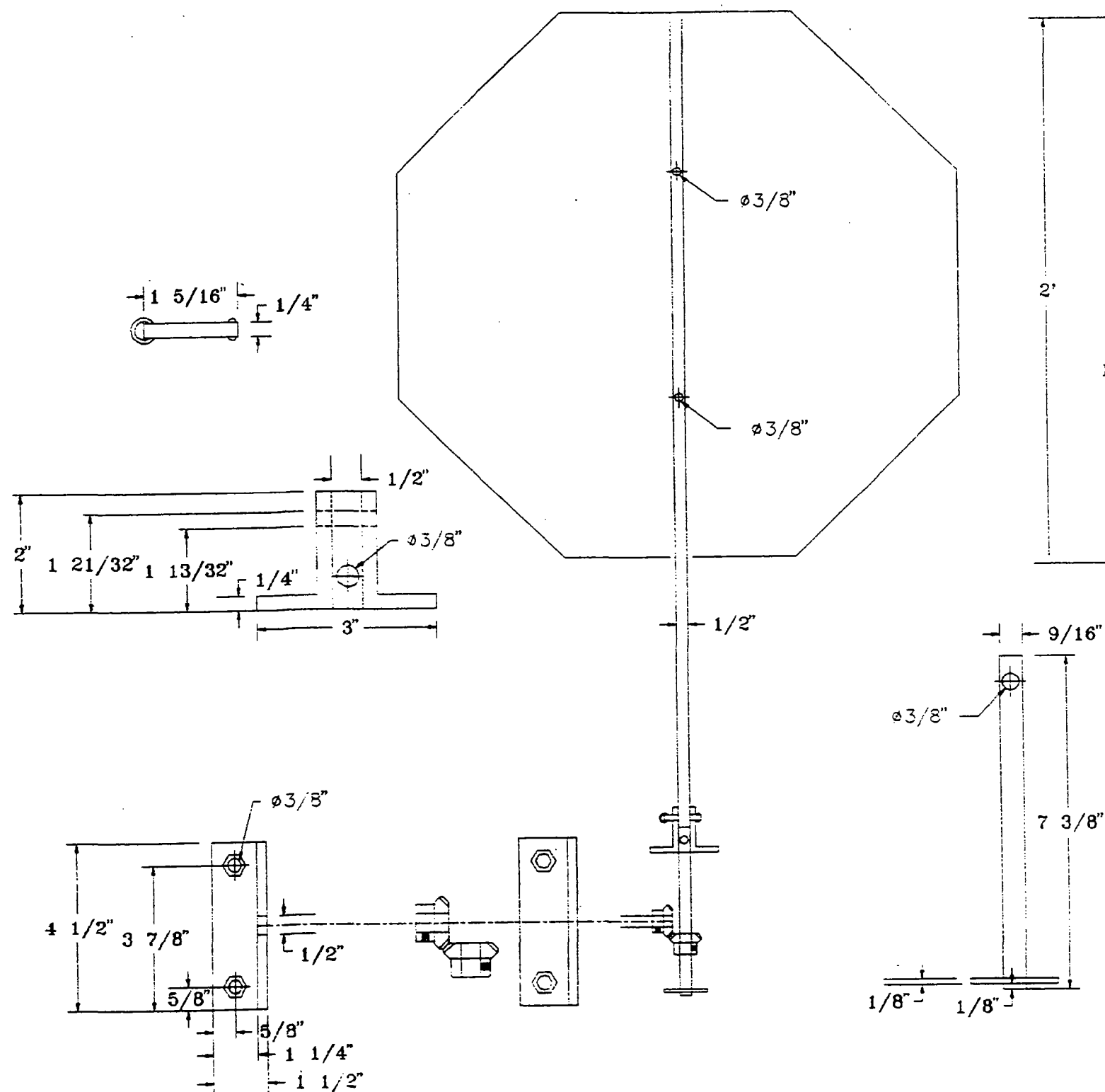
REVISED: RLM



ASSEMBLY: FLAGGER GATE

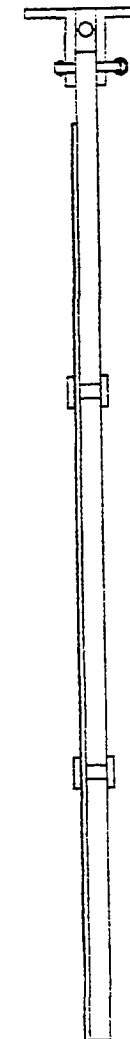
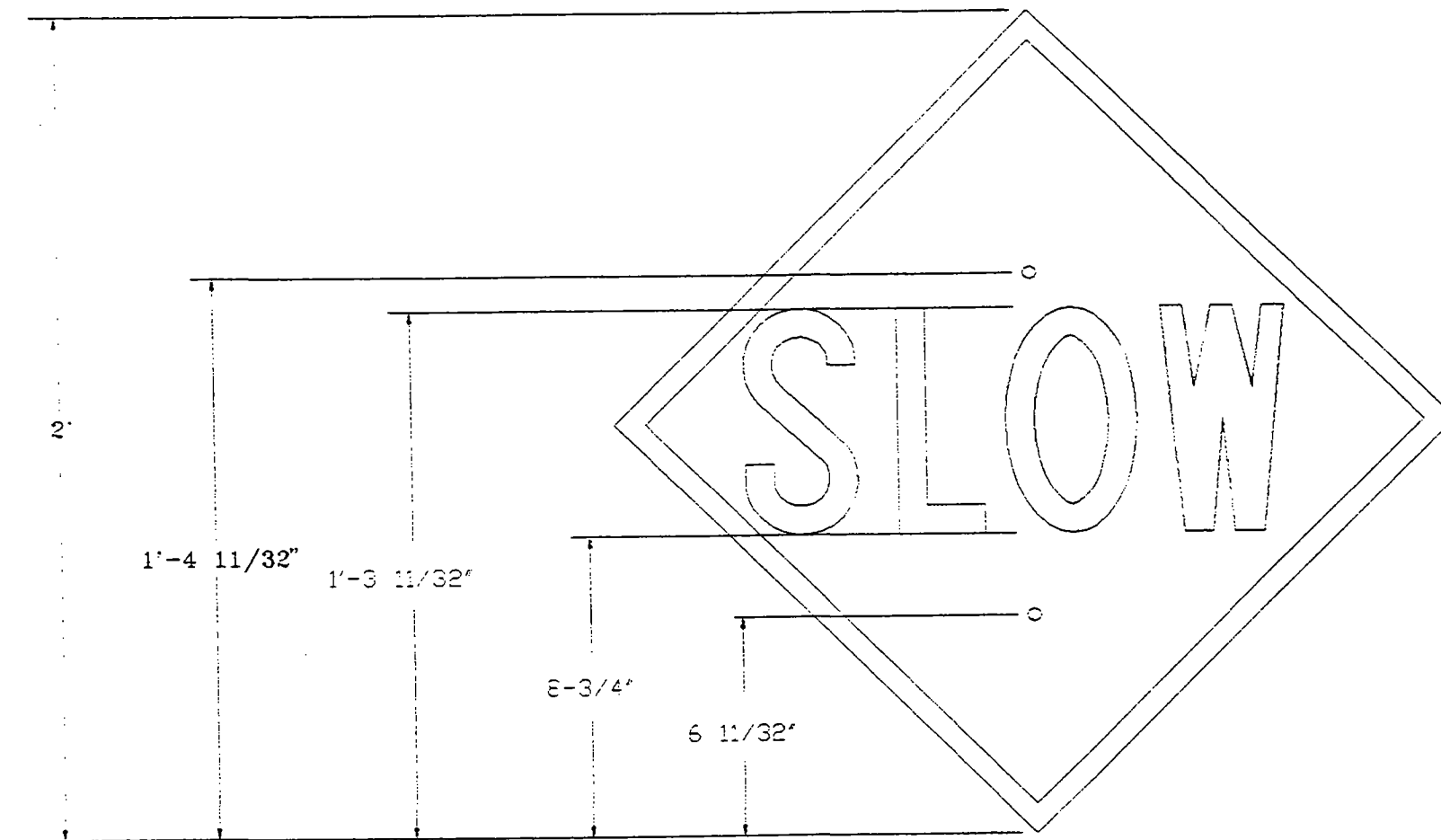
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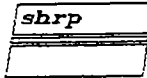
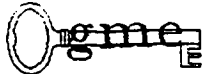
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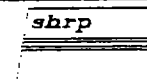
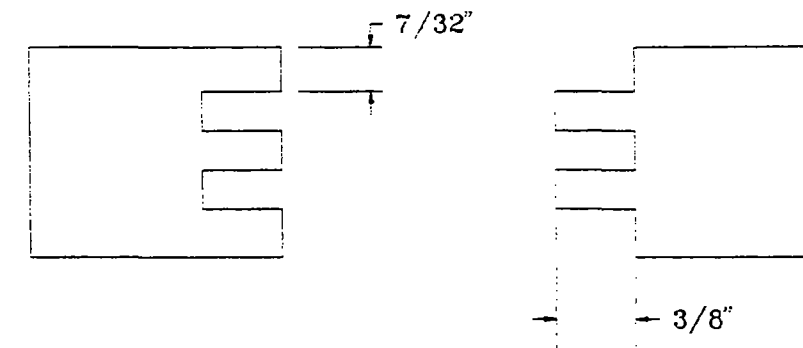
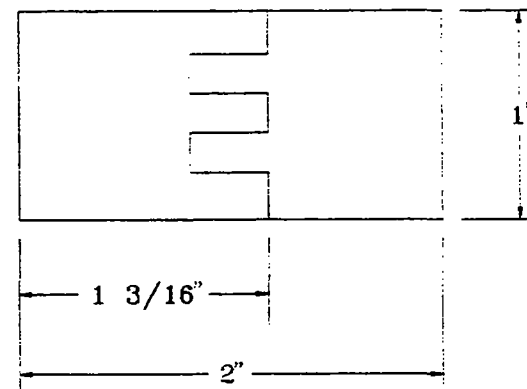
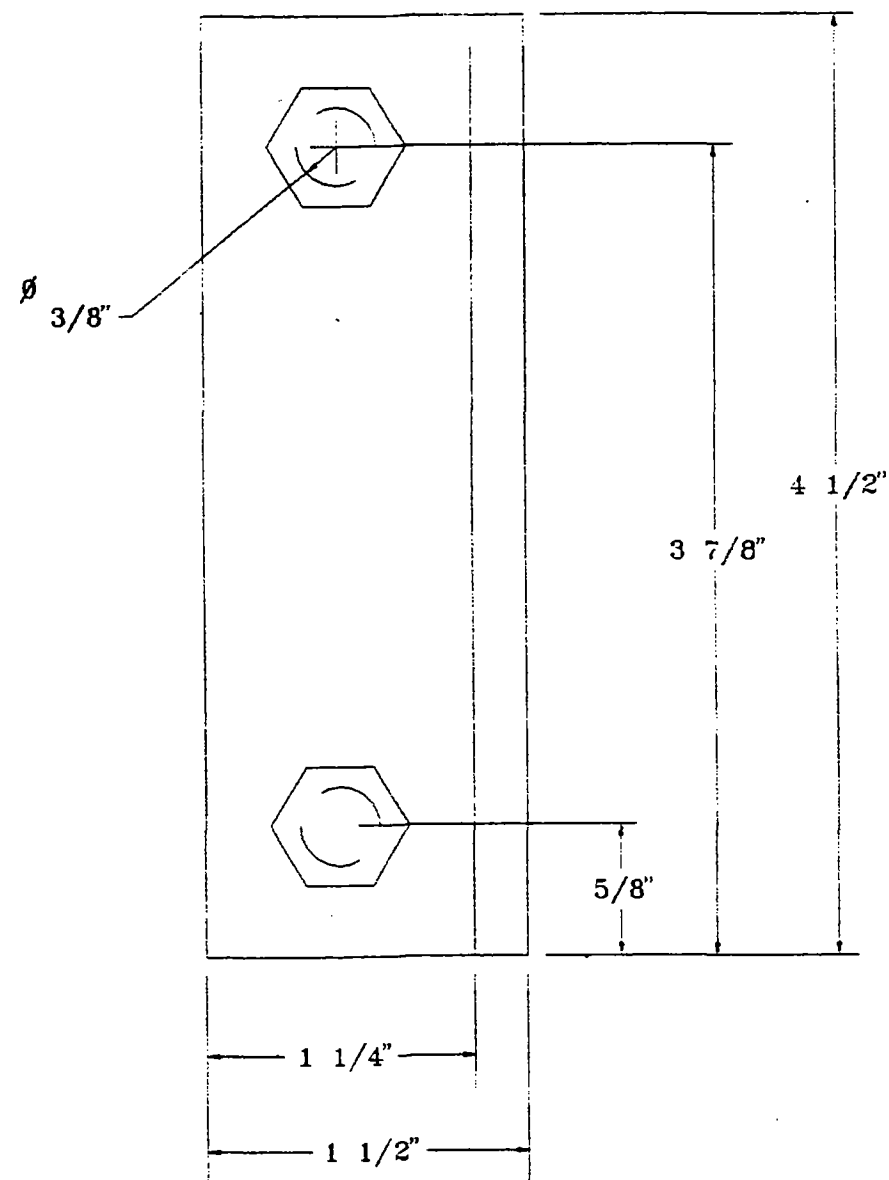
DATE: 8-20-92



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



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



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

TITLE: SHAFT BRACKET & COUPLER

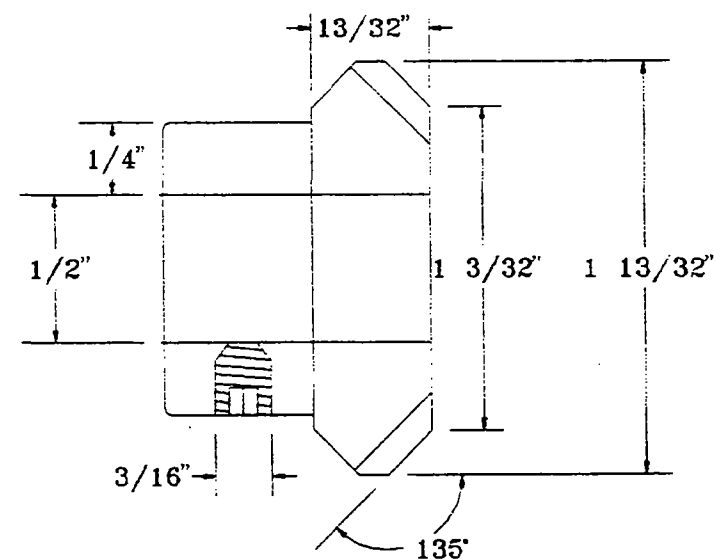
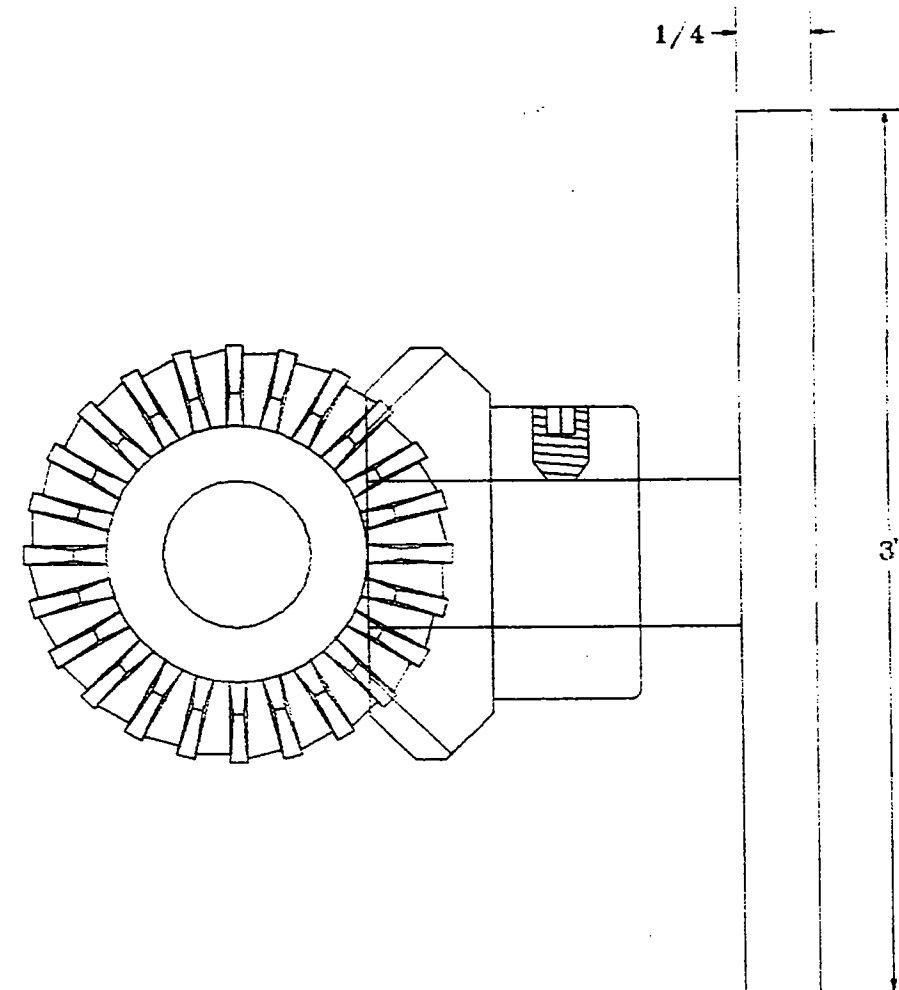
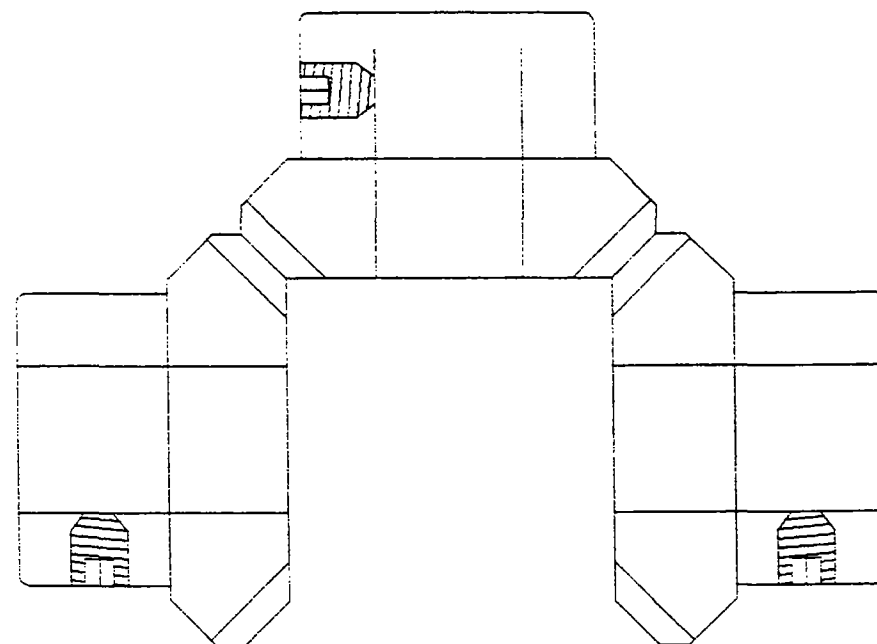
DRAWN BY: JMM
REVISED: RLM



ASSEMBLY: FLAGGER GATE

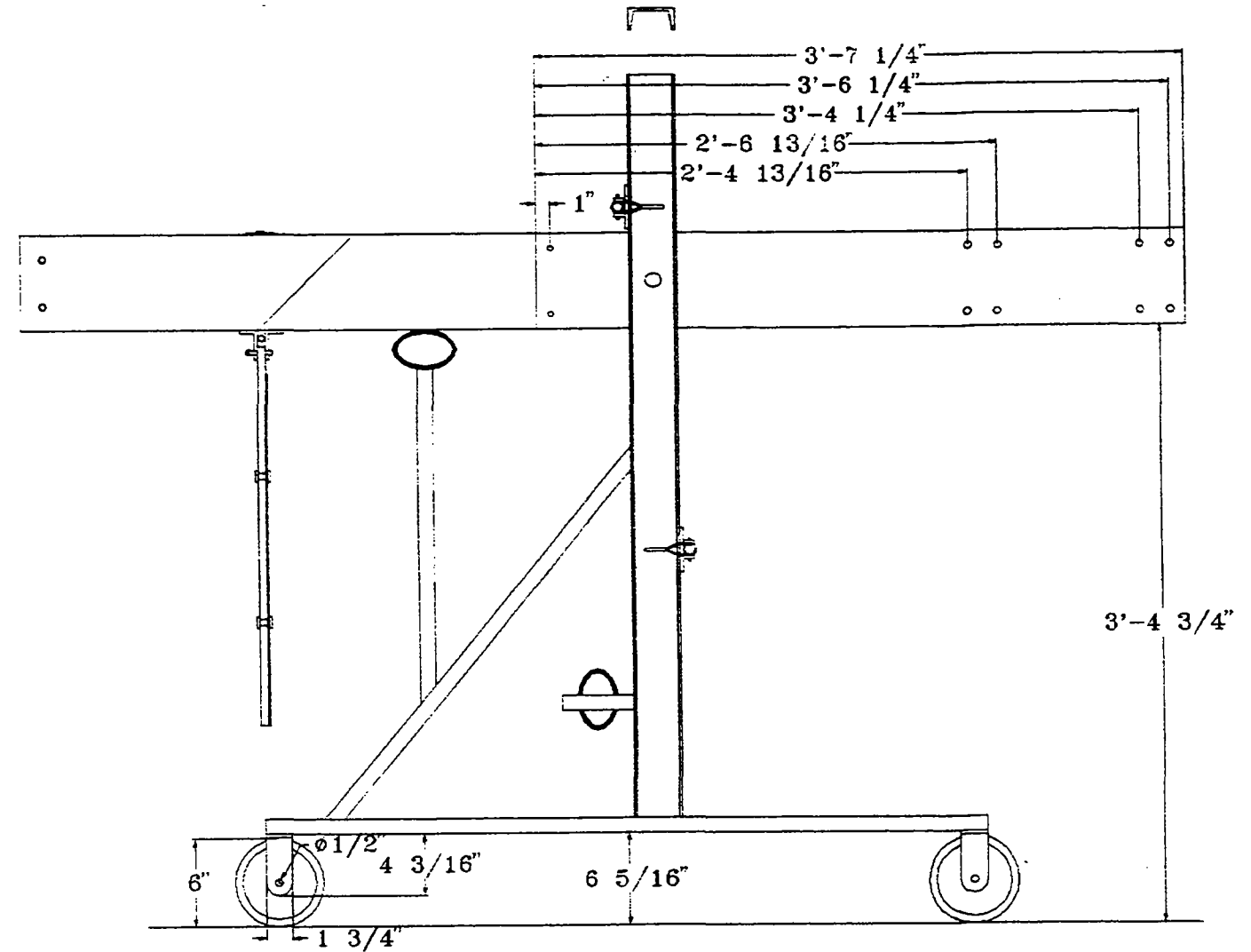
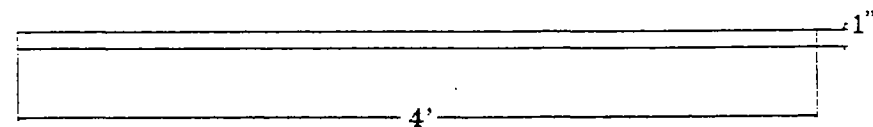
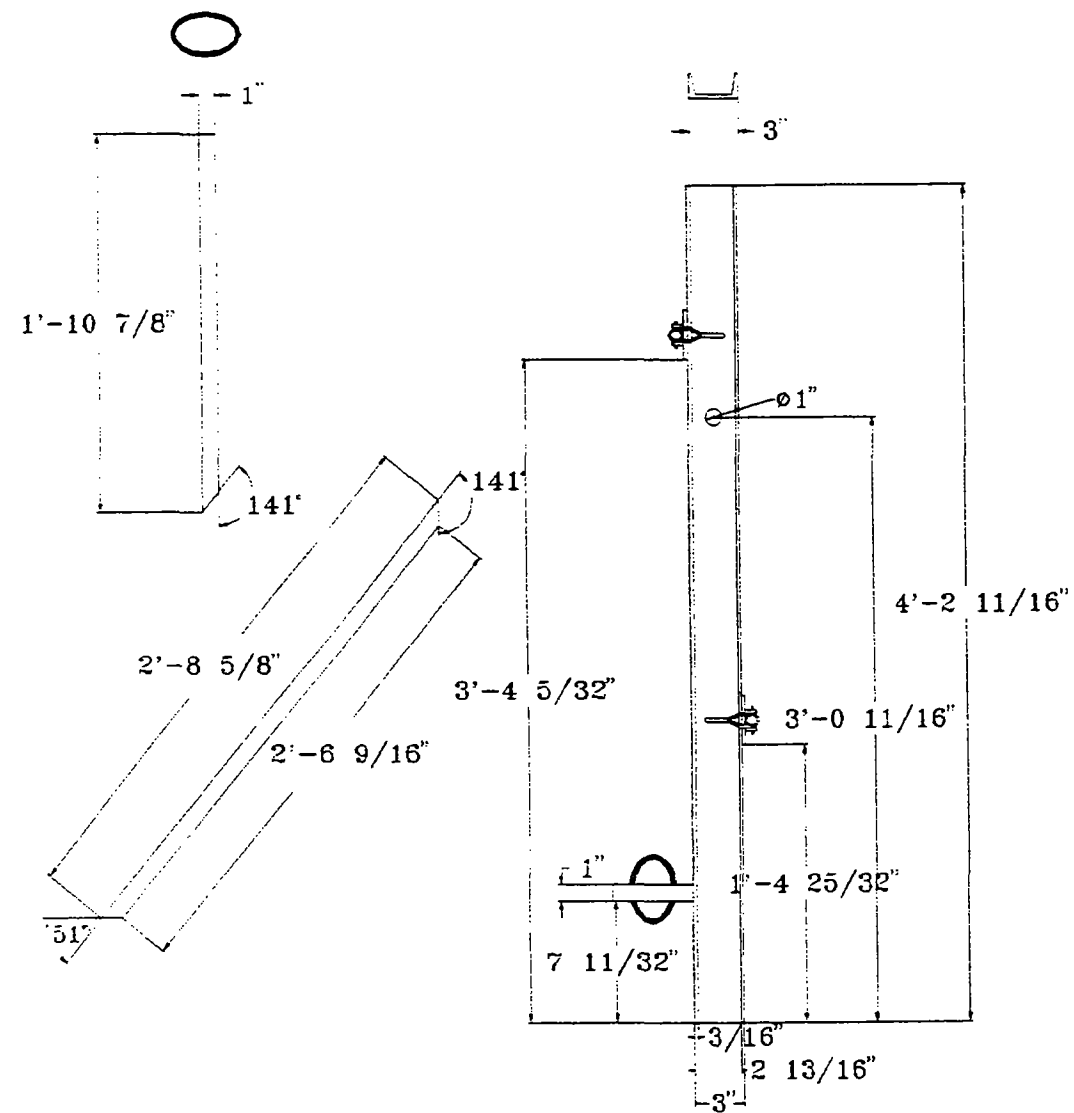
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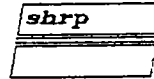
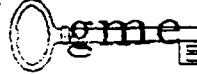
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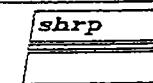
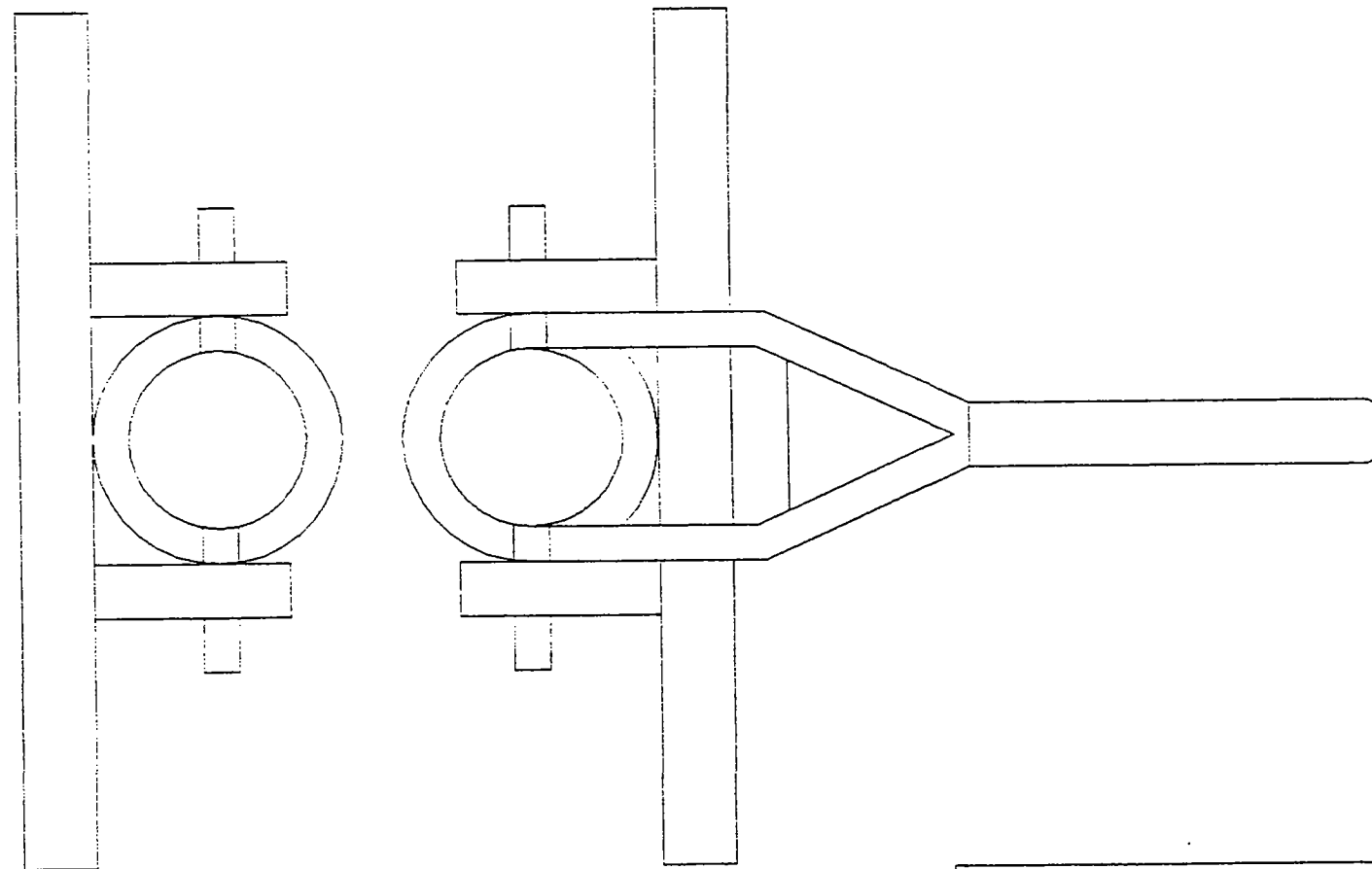
DATE: 9-16-92



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



 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



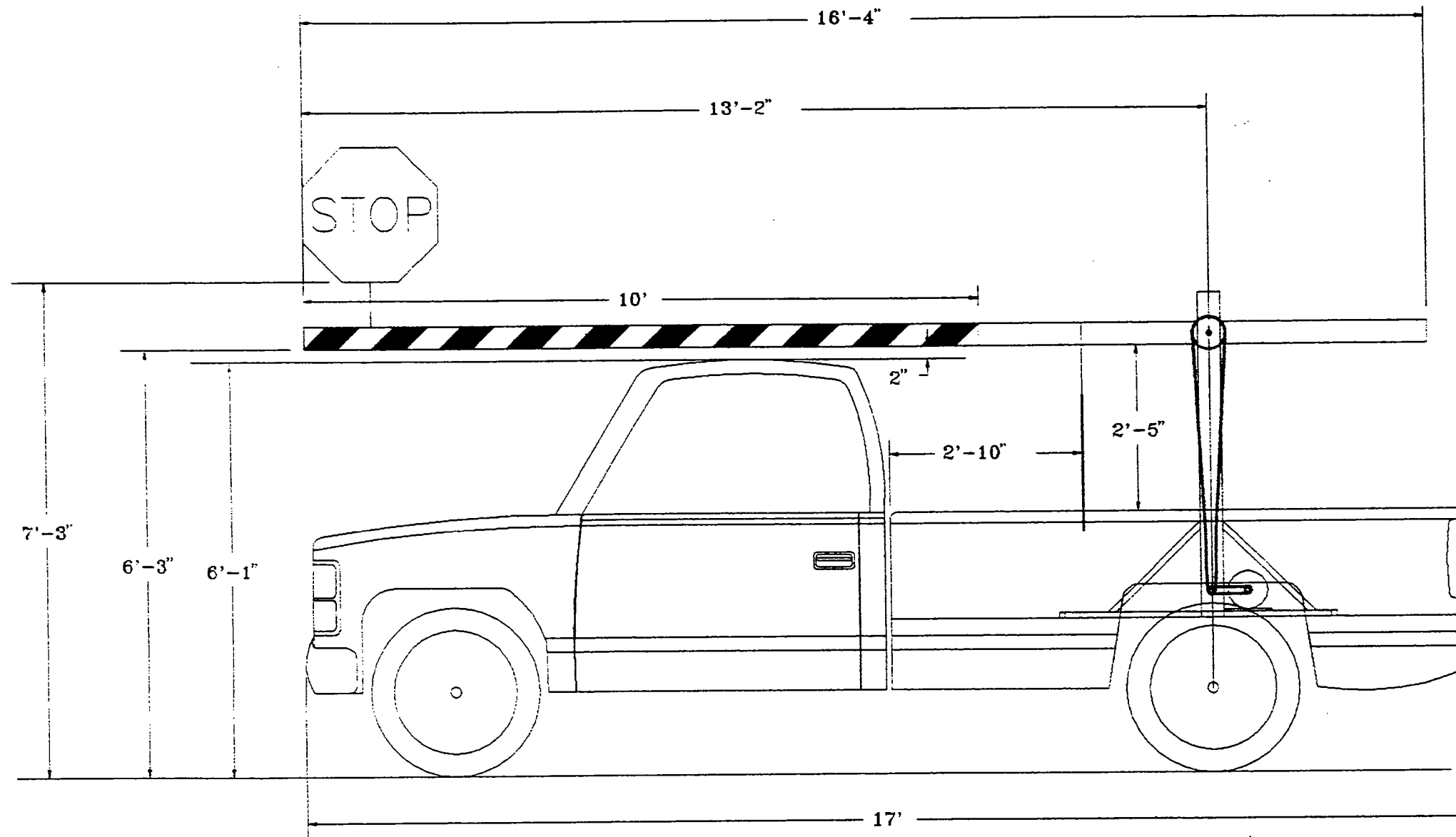
STRATEGIC HIGHWAY RESEARCH PROGRAM

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



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

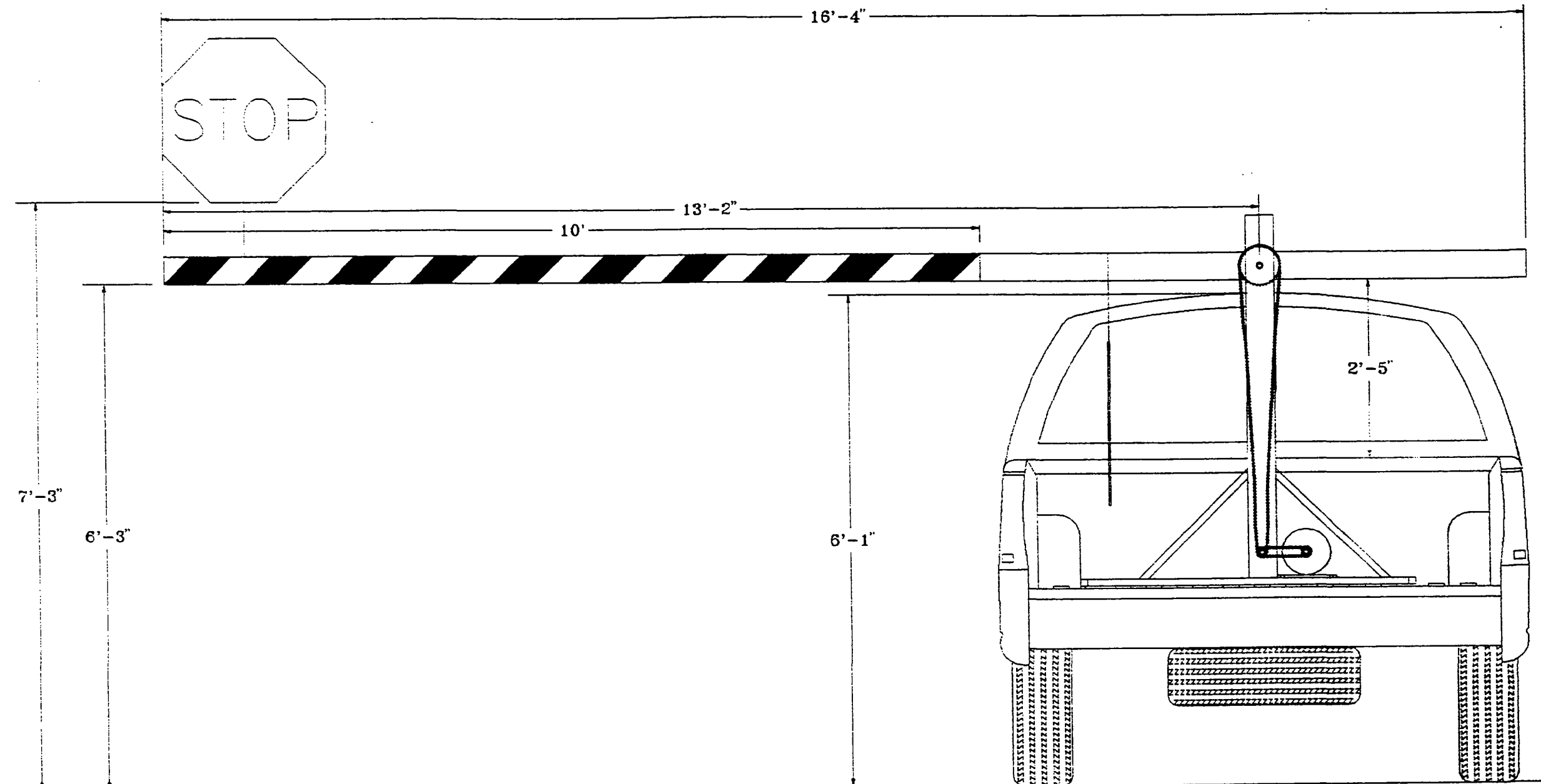
REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 10 OF 13

DATE: 9-17-92



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

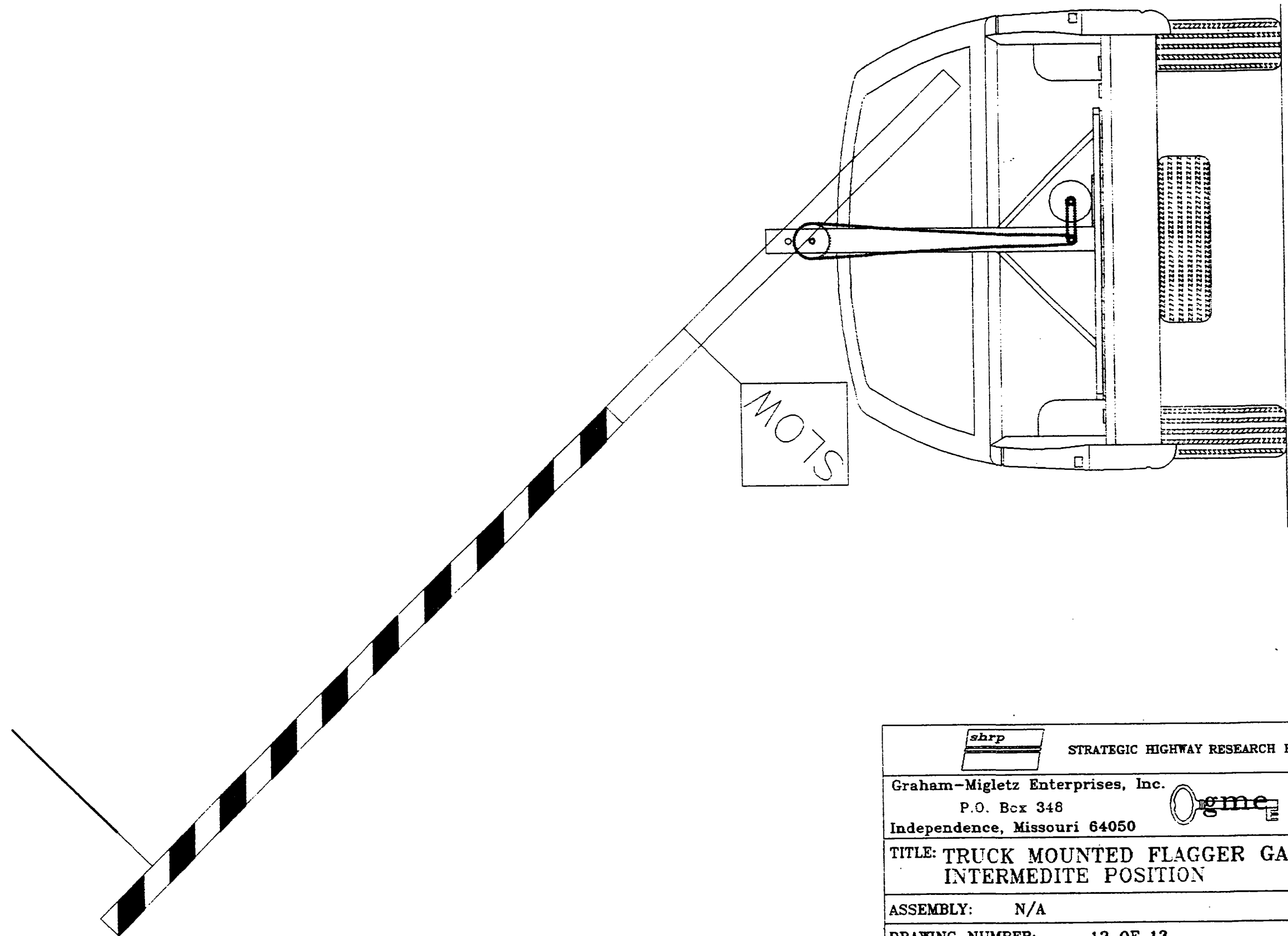
REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 11 OF 13

DATE: 9-18-92



shrp

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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

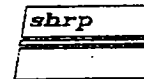
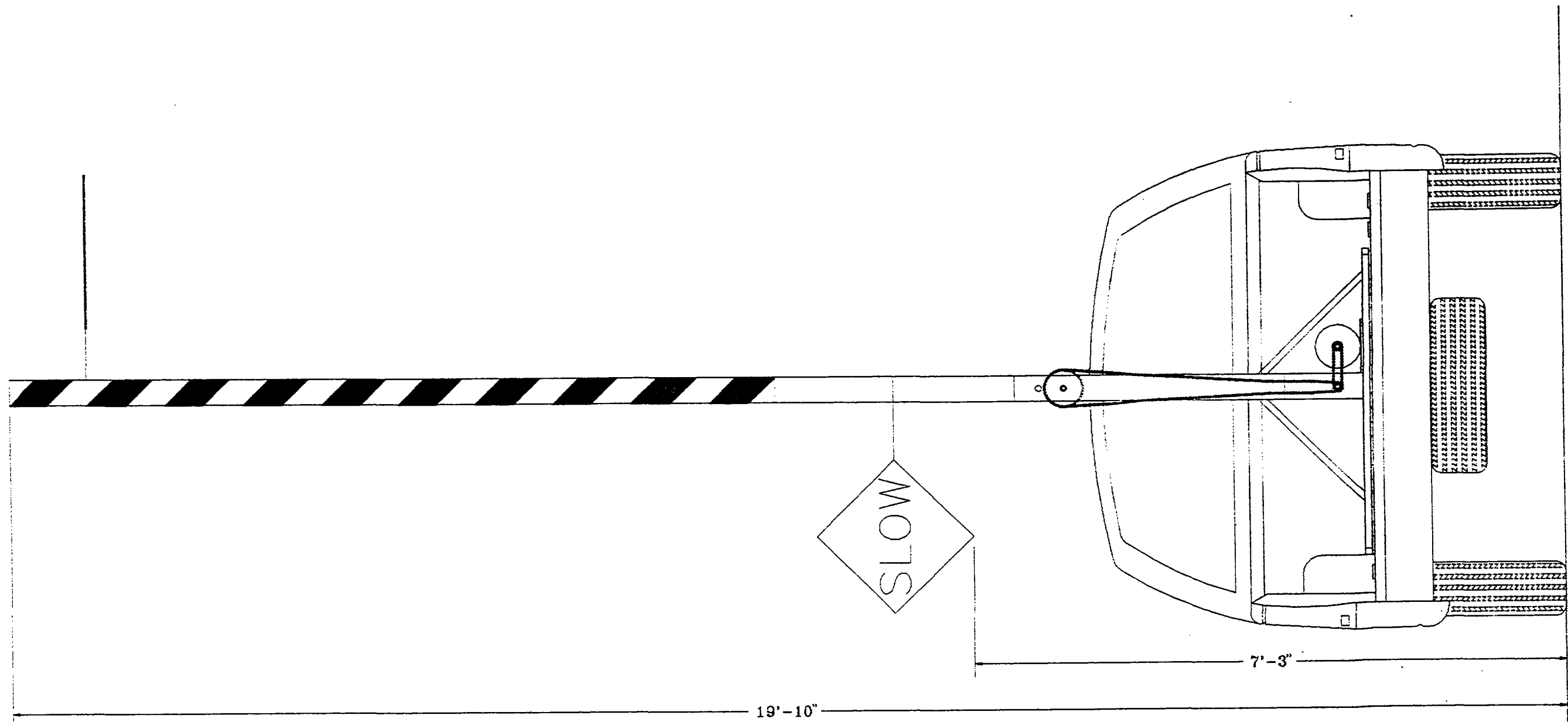
REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 12 OF 13

DATE: 9-18-92



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
(SLOW MODE)

DRAWN BY: RLM

REVISED: RLM

ASSEMBLY: N/A

SCALE: NONE

DRAWING NUMBER: 13 OF 13

DATE: 9-18-92

When the ignition key is in the OFF position the shutoff valve is closed and does 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 check 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. It's 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 stiction 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 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 is important that the parking brake be 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 valve 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 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 monetarily 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 in 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
TACSPEED.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
	+12VDC CLEAR TB3-2 FUSE 5
	GND BLACK TB2-2
34	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	TILT	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.	HEADLIGHT SW.	RED	26
TS2-7	HEADLIGHT SW.	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 INBOTTOM 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

DIGTIAL I/O
STATUS LIGHTS AND BYTE-BIT ADDRESS

LED#	SIGNAL	ADDRESS BYTE-BIT	LED#	SIGNAL	ADDRESS BYTE-BIT
1	RCVT STATUS	0-0	11	RIGHT TURN	1-7
2	EMERG. STOP (RCVR)	0-1	12	OPERATE	2-0
3	TILT	0-2	13	DEAD MAN SW.	2-1
4	FOWARD BIT	1-0	14	IGNITION	2-2
5	REVERSE BIT	1-1	15	IMPACT SW	6-0
6	NEUTRAL BIT	1-2	16	ULTRASONIC	6-1
7	STARTER	1-3	17	LOW AIR	6-2
8	PARKING BRAKE	1-4	18	TRANS. DETENT	7-0
9	LIGHTS	1-5	19	VENT STATUS	7-1
10	LEFT TURN	1-6	20	TRANS. TEMP.	7-2
21	FUEL CUTOFF STATUS	7-4	31		
22	COOLANT TEMPERATURE	7-5	32		
23	LOW OIL	7-6	33	+96VDC	
24	WATER IN FUEL	7-7	34	+5VDC	
25	LOW COOLANT	6-4	35	-12VDC	
26	ENGINE RUNNING	6-5	36	+24VDC	
27	PRESURE SW.	7-3	37	+15VDC	
28			38	-15VDC	
29			39	+12VDC UNREG.	
30			40	+12VDC REG.	
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	J1	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 EVEN		GND	GND	GND	GND

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

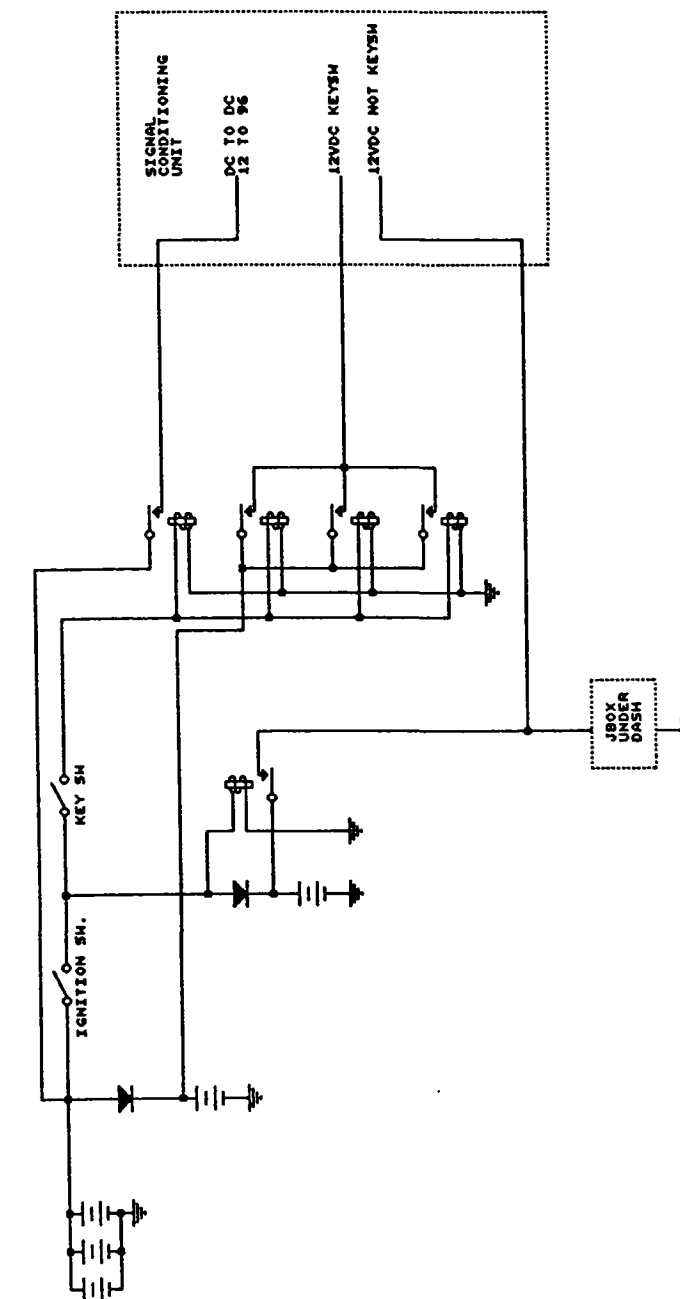
COMPUTER POWER SUPPLY

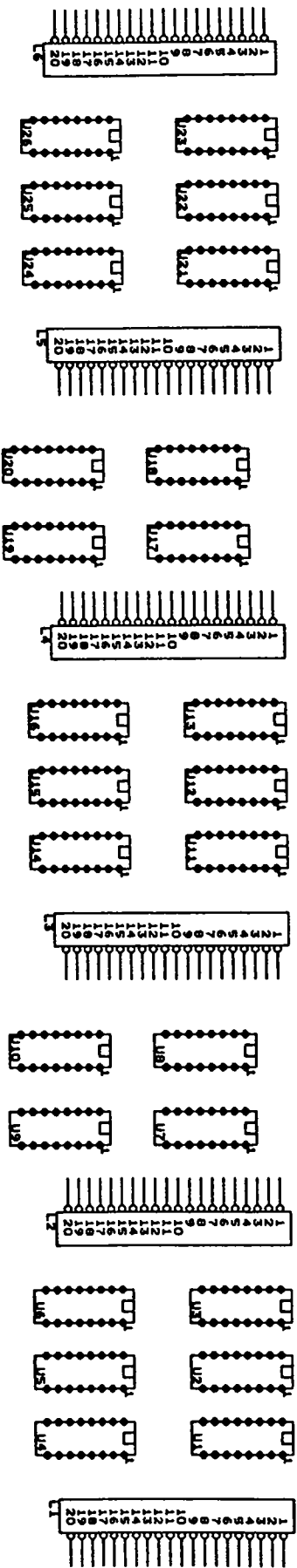
PIN	VOLTAGE	WIRE COLOR
1	+5VDC	RED
2	GND	BLACK
3	+5VDC	RED
4	GND	BLACK
5	+12VDC	YELLOW
6	GND	BLACK
7	-12VDC	BLUE
8	GND	BLACK
9		

WIREWARP LIST LED PANEL

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





U1,2,3,11,12,13,21,22,23 680 OHMS R-PACK
 U7,8,9,10,17,18,19,20 5.6K OHMS R-PACK
 U4,5,6,14,15,16,24,25,26 3091
 L1,2,3,4,5,6 000 PINS +

VIEWS FROM REAR, WIRE WARP SIDE

ENSCO, INC.	
5400 PORT ROYAL RD.	
SPRINGFIELD, VA. 22152	
77110	LED LAYOUT (LEDPANEL.0R3)
Size Document Number	2036-B-
REV	8
Date:	JUL 1 1991
of	1

DIGITAL ISOLATION, BUFFER, STATUS INDICATOR

FIG. 1 TO I/O PORT (35 CHANNELS)

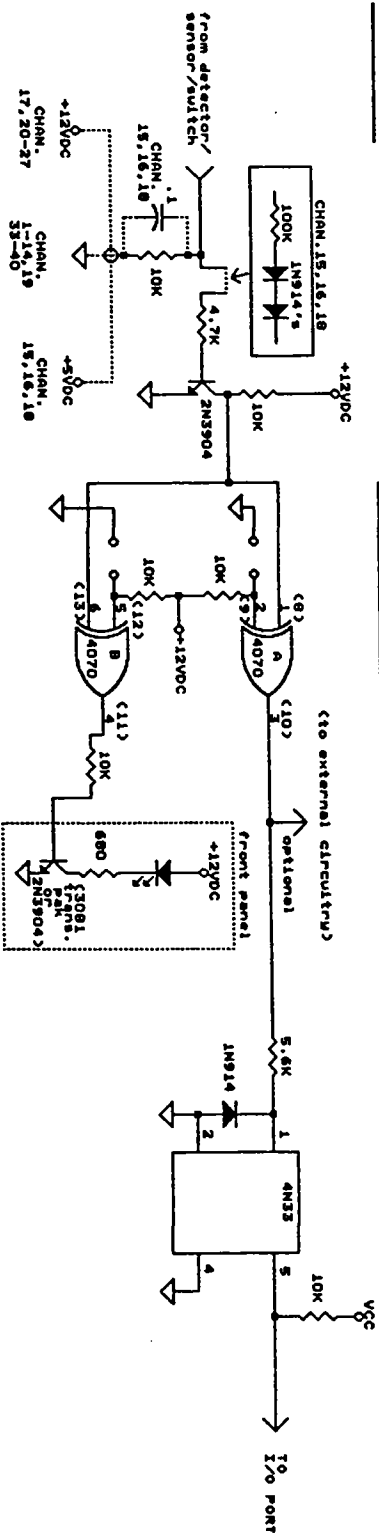
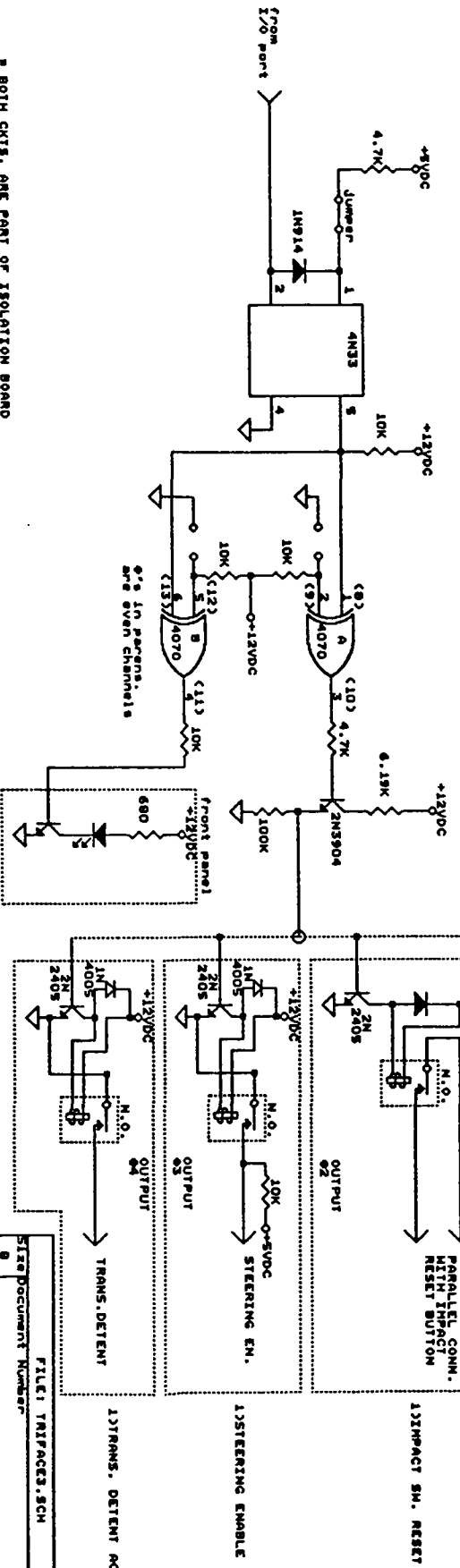
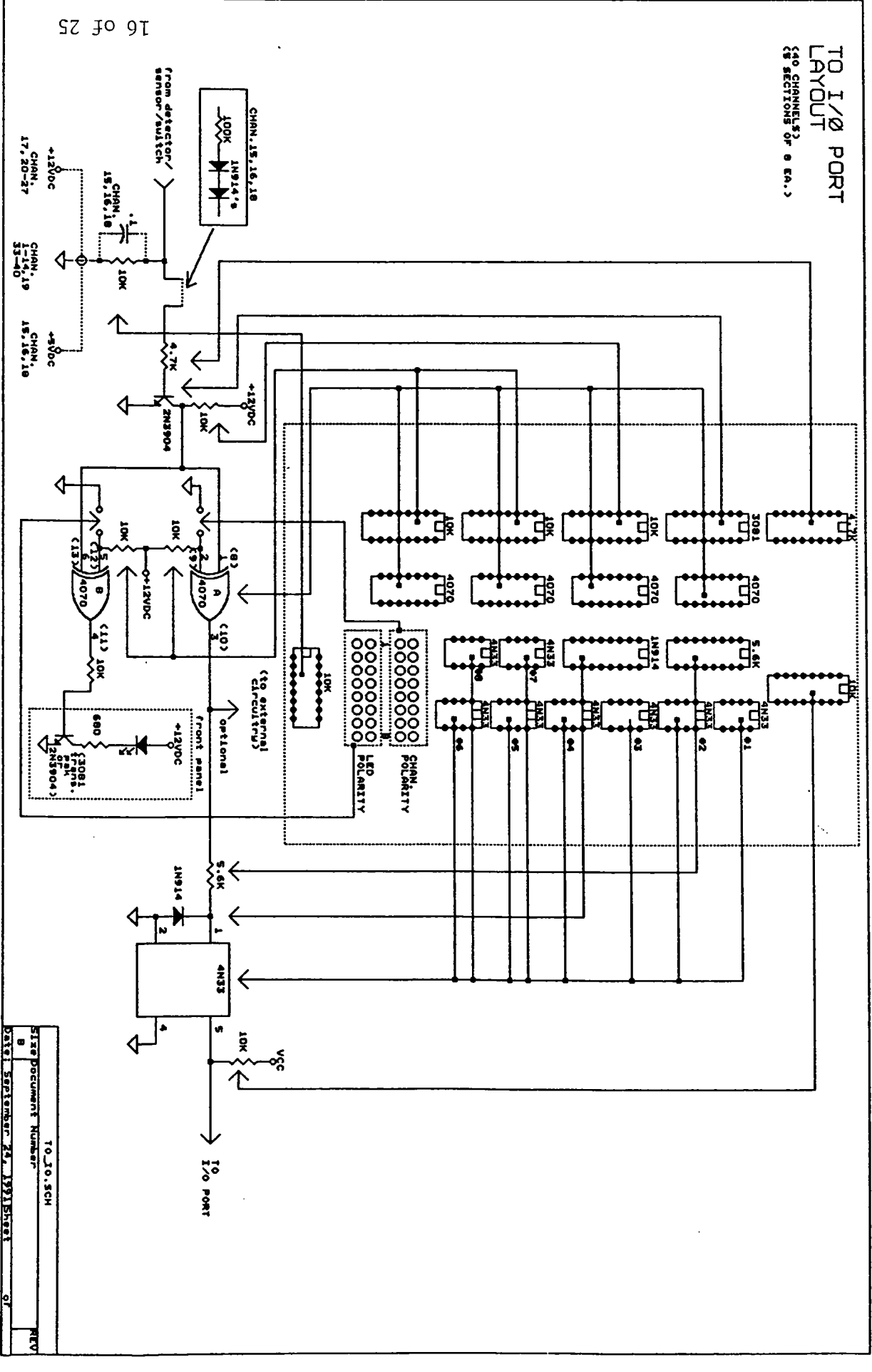
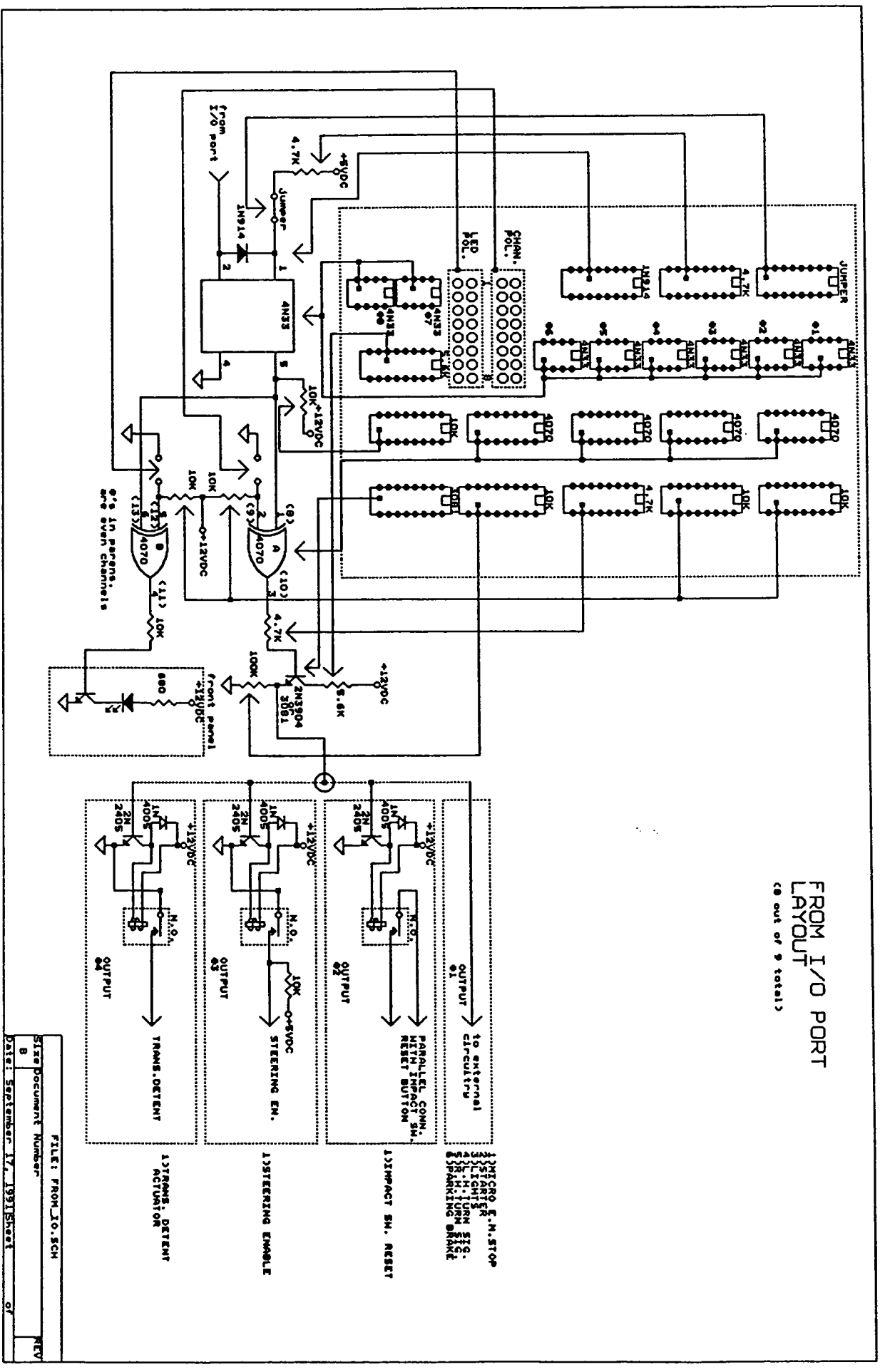
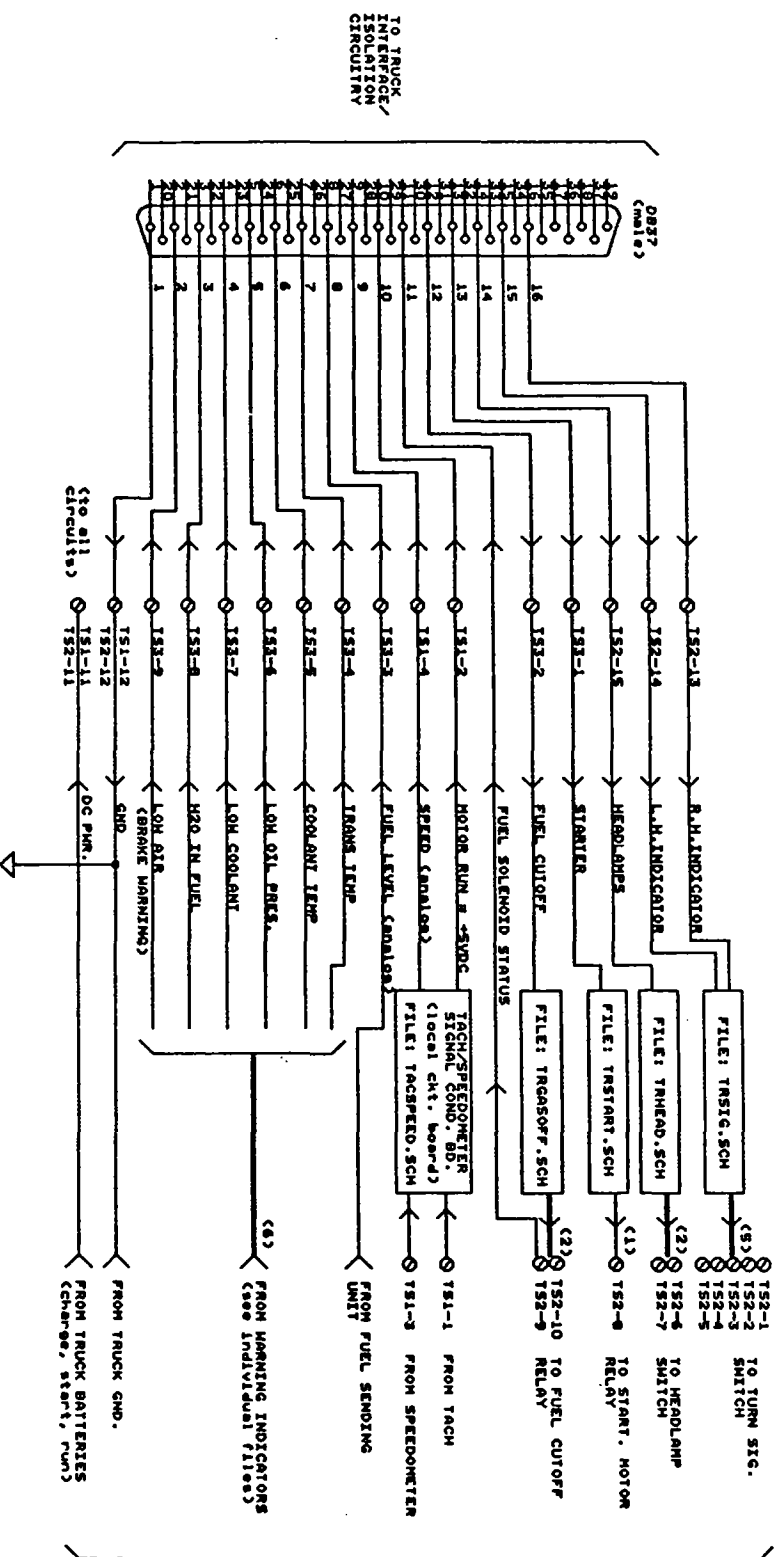


FIG. 2 FROM I/O PORT (9 CHANNELS)



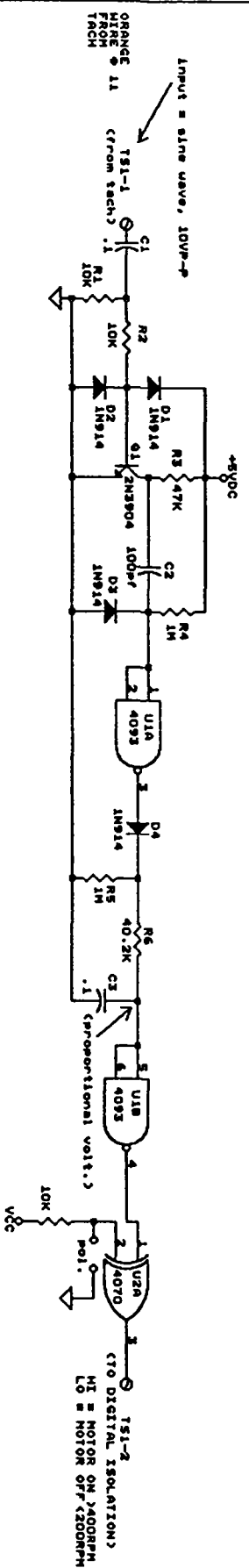


JUNCTION BOX (mounted under dashboard)

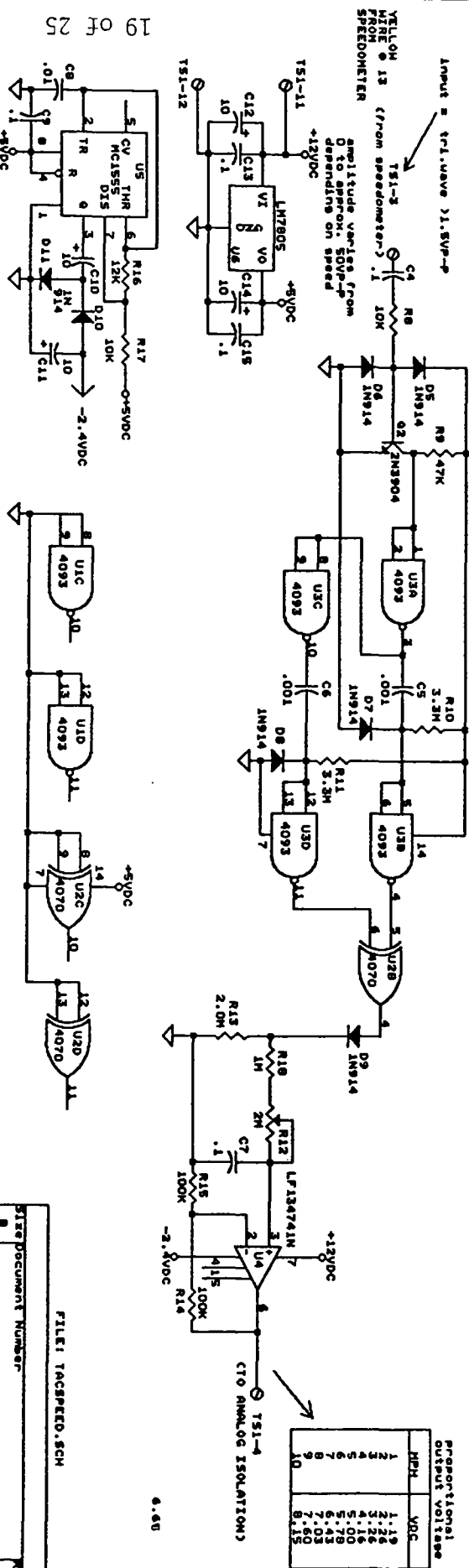


NOTES:	
1) TMSIG = 12 POSITIONS	2) TMSIG = 12 POSITIONS
3) TMSIG = 10 POSITIONS	4) TMSIG = 10 POSITIONS
FILE1 DASHBOX.SCH	
STEP DOCUMENT NUMBER	REV
DATE	DATE
FILE1 DASHBOX.SCH	REV

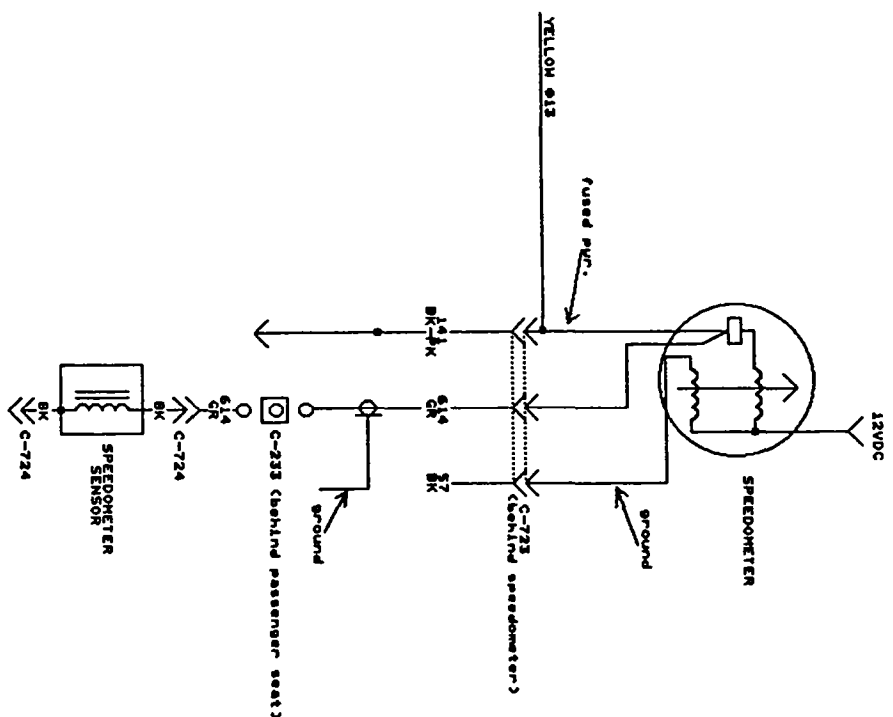
TACHOMETER INTERFACE/CONDITIONER (Junction box)



SPEEDOMETER INTERFACE/CONDITIONER (Junction box)

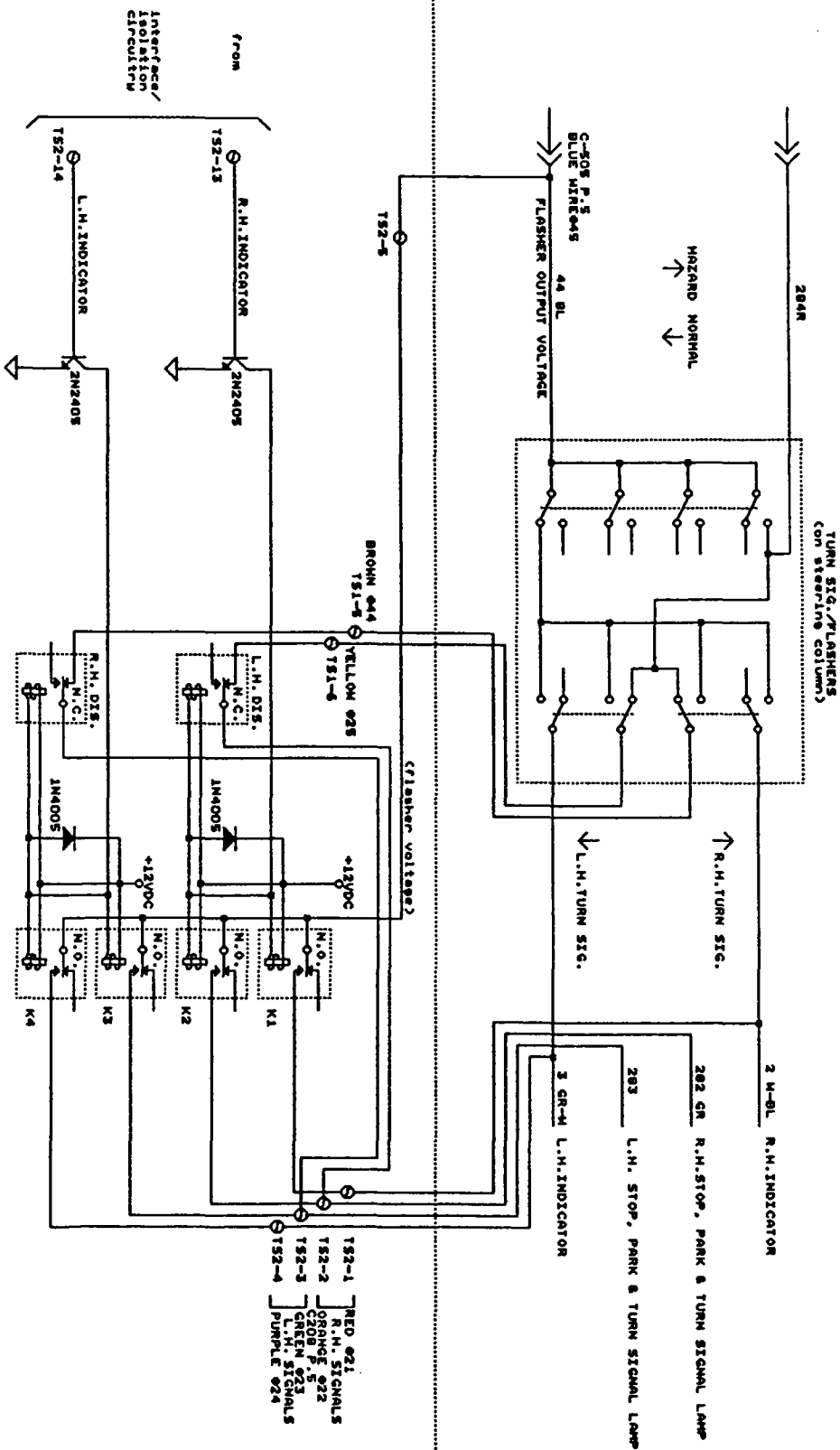


SPEEDOMETER (part 1a1)



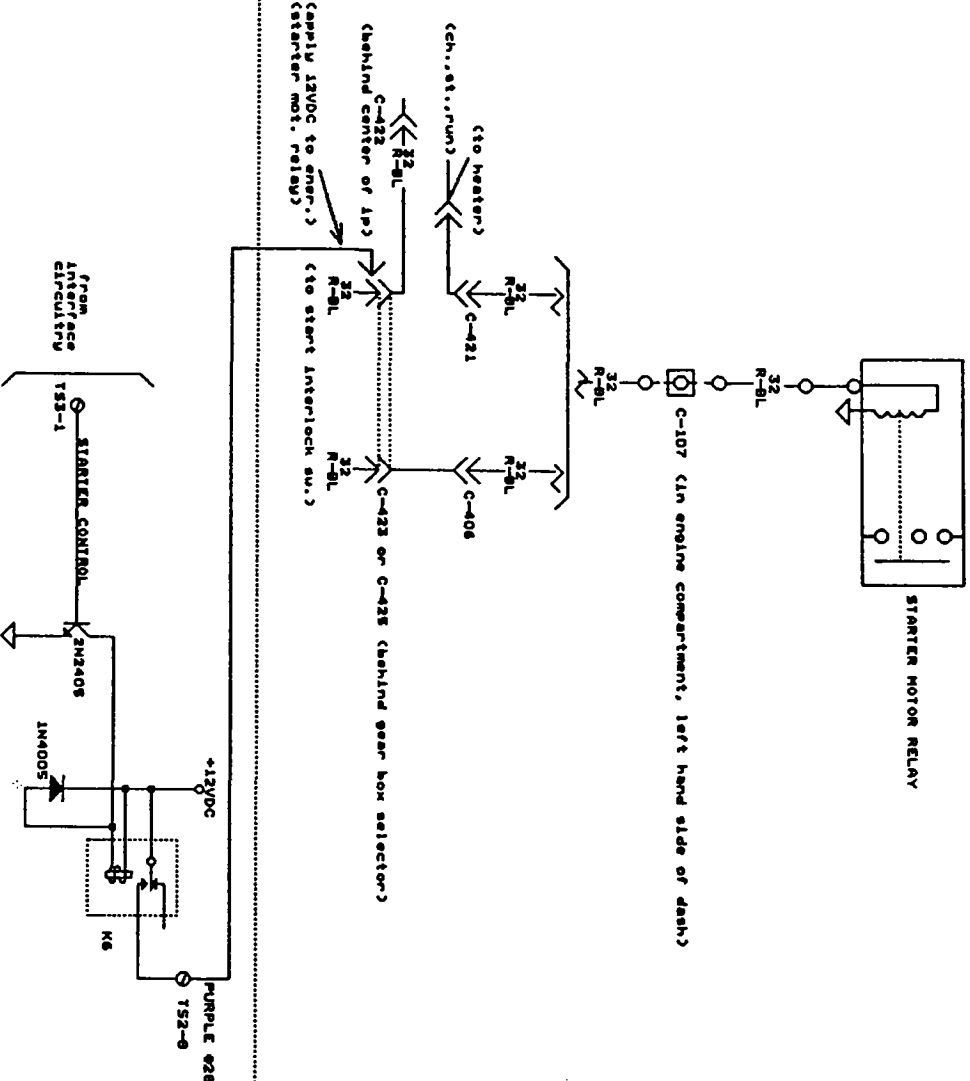
FILE: TSPEED.SCH	
Sheet Document Number	REV
Date: October 8, 1991	07

TRUCK FLASHER/SIGNAL ASSEMBLY (part 1a1)



FILE: TRFLS.SCH	
Sheet Document Number	REV
Date: October 8, 1991	07

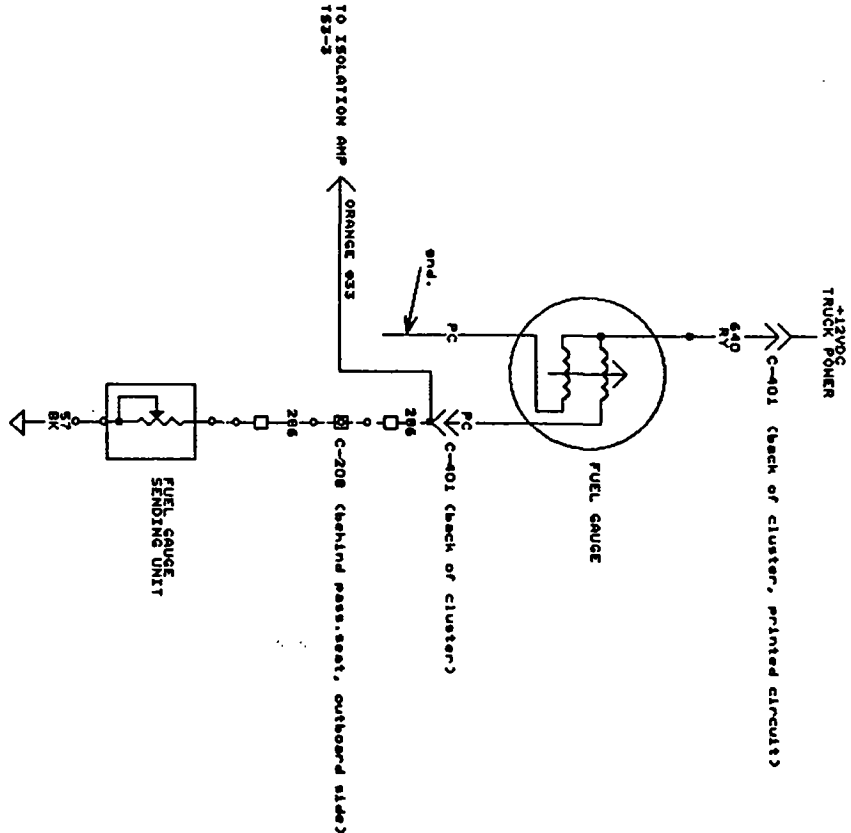
STARTER MOTOR RELAY (part 1a)



MICRO CONTROLLED STARTER (Junction box)

FILE: TSTART.SCH
Size Document Number
0
Date: October 8, 1991
0

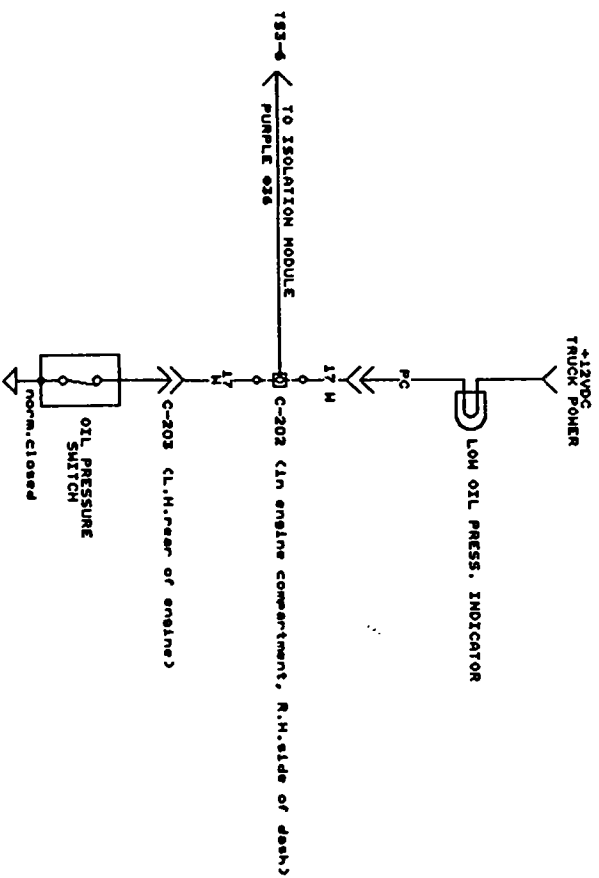
FUEL GAUGE AND SENDING UNIT (part 1a)



Size Document Number
0
Date: October 8, 1991
0

LOW OIL PRESSURE (part 1a)

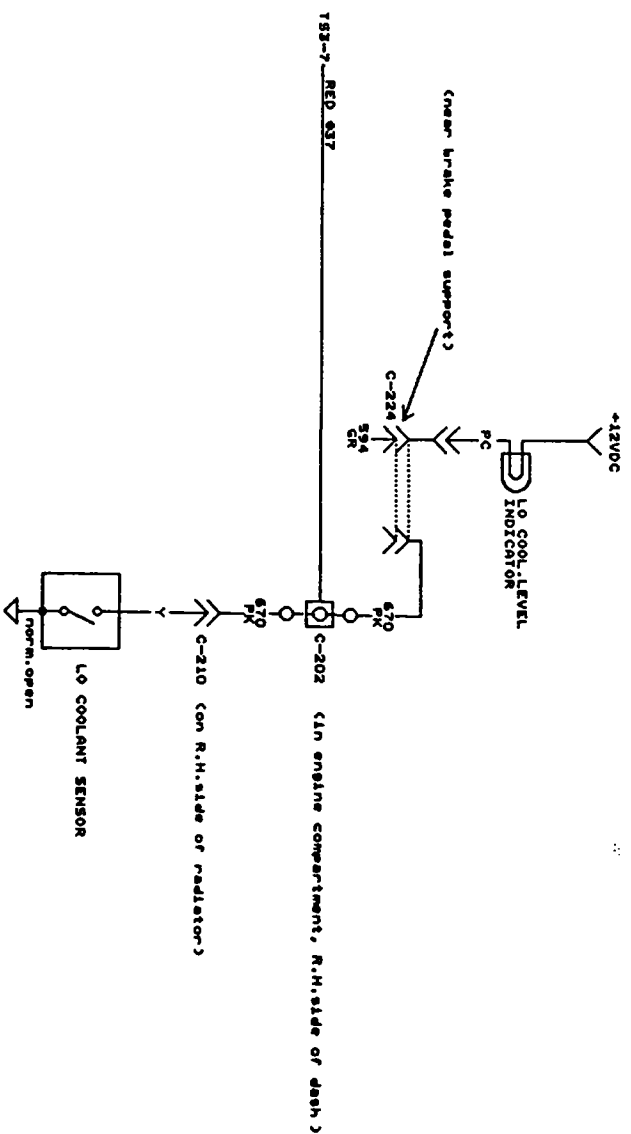
(Sensor and Indicator)



FILE: TROIL.SCH

Size	Document Number	REV
B		
Date:	October 8, 1991	8/

LOW COOLANT LEVEL (part 1a)

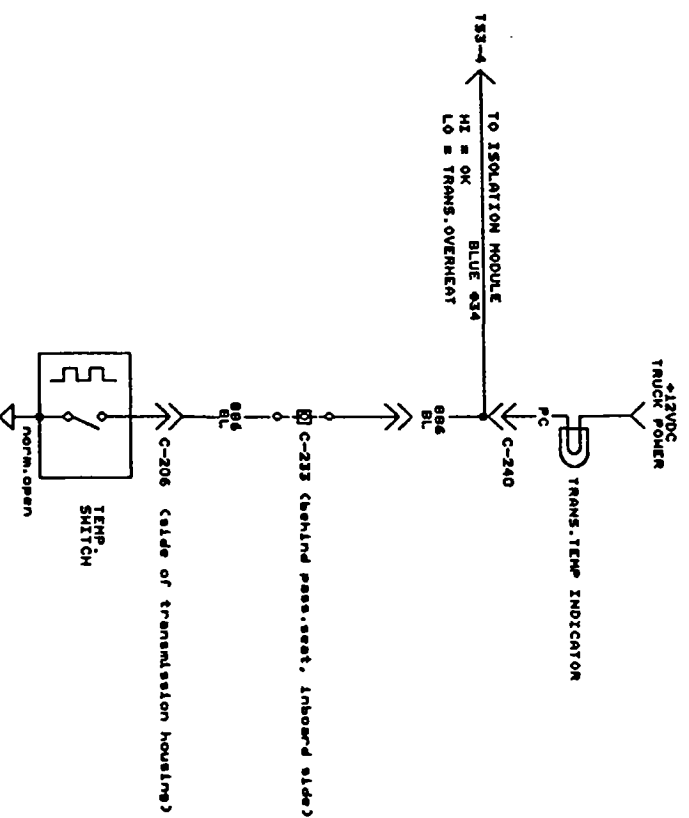


FILE: TRCOOLEV.SCH

Size	Document Number	REV
B		
Date:	October 8, 1991	8/

TRANSMISSION TEMPERATURE (part i a l)

(Indicator and sensor)

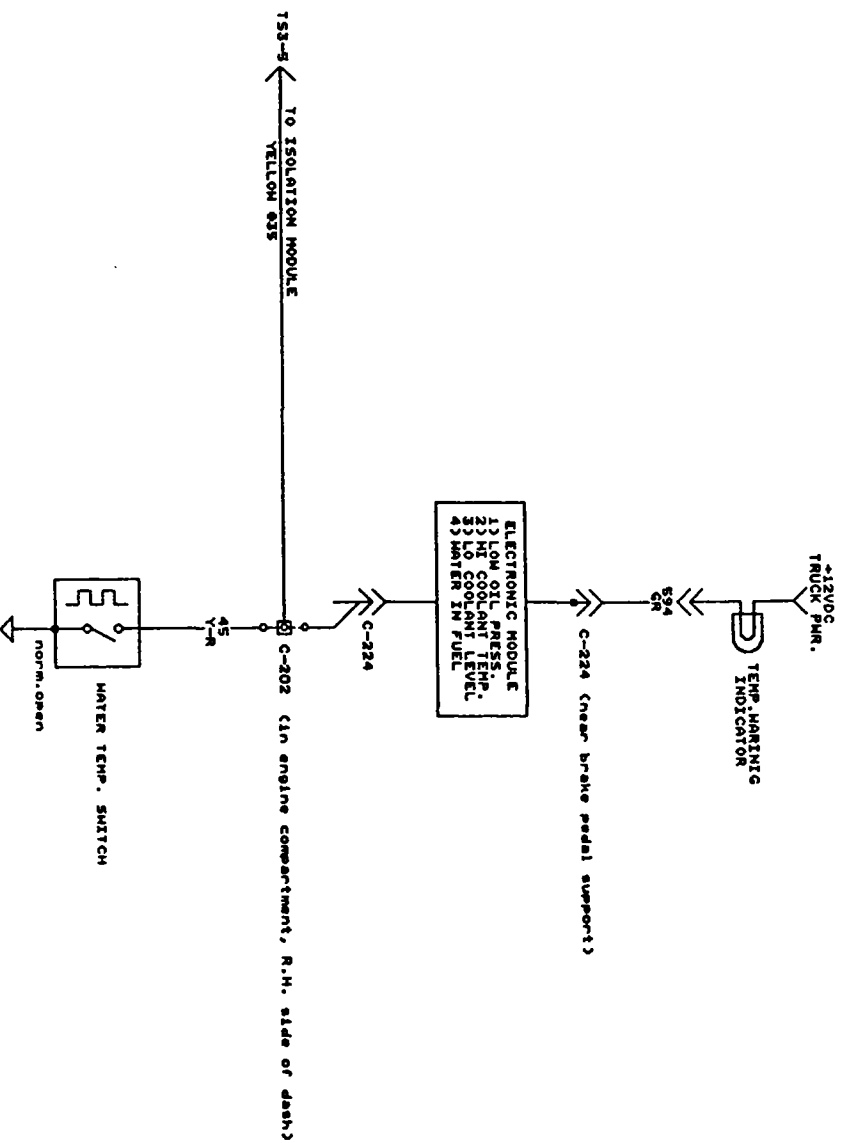


FILE: TRYRANS.SCH

Size Document Number	8	REC
Date	October 9, 1981	Sheet of

COOLANT TEMPERATURE (partial)

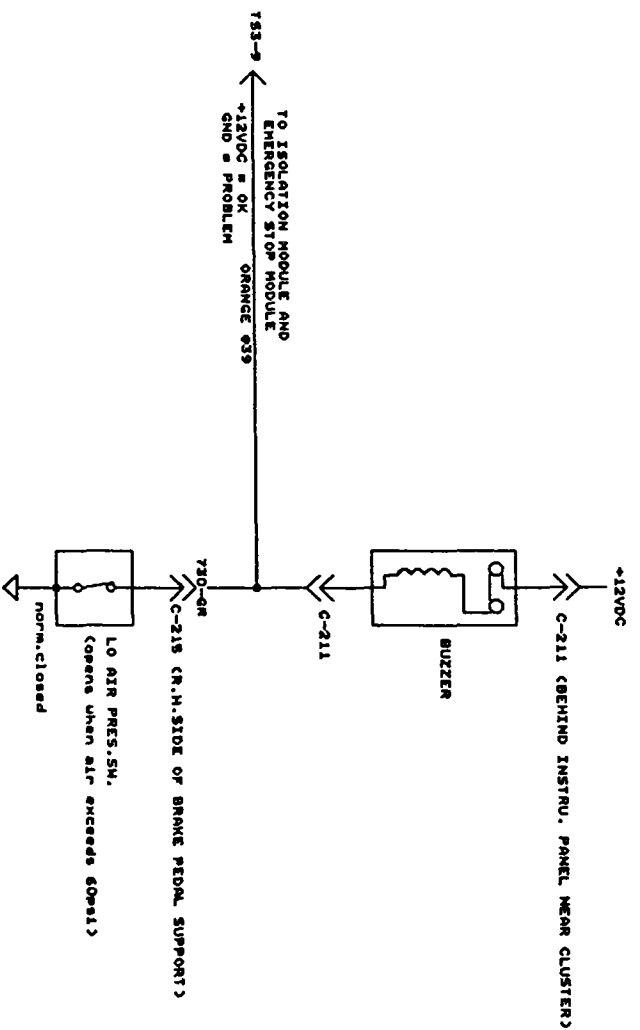
(sensor and indicator)



FILE: TRCOOL.SCH

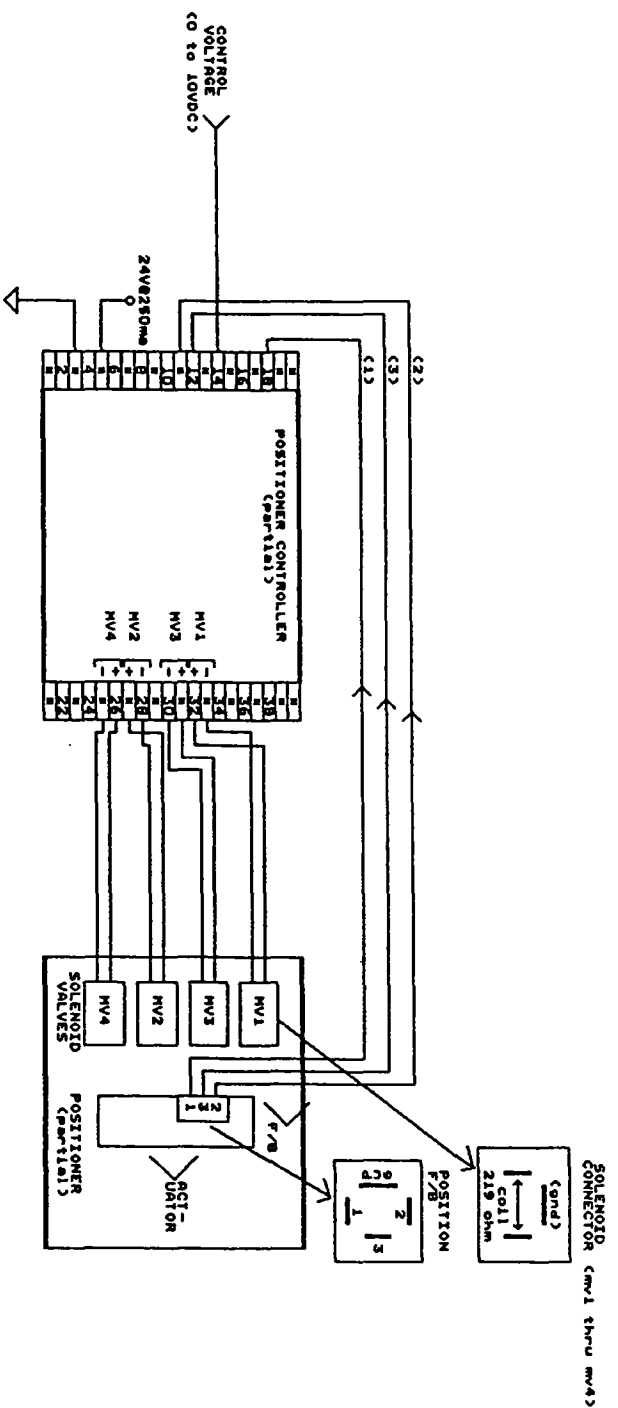
Size Document Number	0	11
Date:	October 8, 1991	Sheet 9 of 11

LOW AIR PRESSURE (partial) (sensor and buzzer)



FILE: TRL001R.SCH	
Size Document Number	REV
DATE: 01/01/01	01

REXROTH E/P POSITIONER



FILE: TRANSPOS.SCH	
Size Document Number	REV
DATE: 01/01/01	01