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April 27, 1999

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Re: Change in Identification filing
Union Switch & Signal
Original FCC ID: G3V2Z2TRANSPOUNDER
New FCC ID: J8C2Z2TRANSPOUNDER

BOSTON
NEW YORK

SILICON VALLEY
SOUTHERN CALIFORNIA
TWIN CITIES
WASHINGTON, DC

Dear Joe:

On behalf of Union Switch & Signal, this is to respond to your e-mail of February 19, 1999 (attached), and your recent telephone conversation with David Munson concerning the above-referenced *Change in Identification* application. Specifically, per your e-mail, enclosed please find the following: device schematics and a user manual. Exterior photographs of the device were submitted with the initial *Change in Identification* application; we will forward photographs of the device's sole interior component, a PCB shortly and it is our understanding that the delay in providing the interior photographs will not hold up issuance of the re-identification grant.

Although the device authorization grant shows that it was certified in accordance with the revised 1989 Part 15 rules, because neither the FCC Laboratories nor Union Switch & Signal are in possession of the original test report submitted with the certification application, you asked whether the device was certified to Section 15.227, and/or whether any waivers or other special arrangements were made with respect to the certification. It is Union Switch & Signal's understanding that the device was certified in accordance with Section 15.227. Moreover, Union Switch & Signal is not aware of any waiver or other special arrangement with respect to such certification. Accordingly, we understand that Union Smith & Signal will not be required to produce a test report in this matter.

Please contact us if you have any questions or comments.

Very truly yours,

Terry G. Mahn

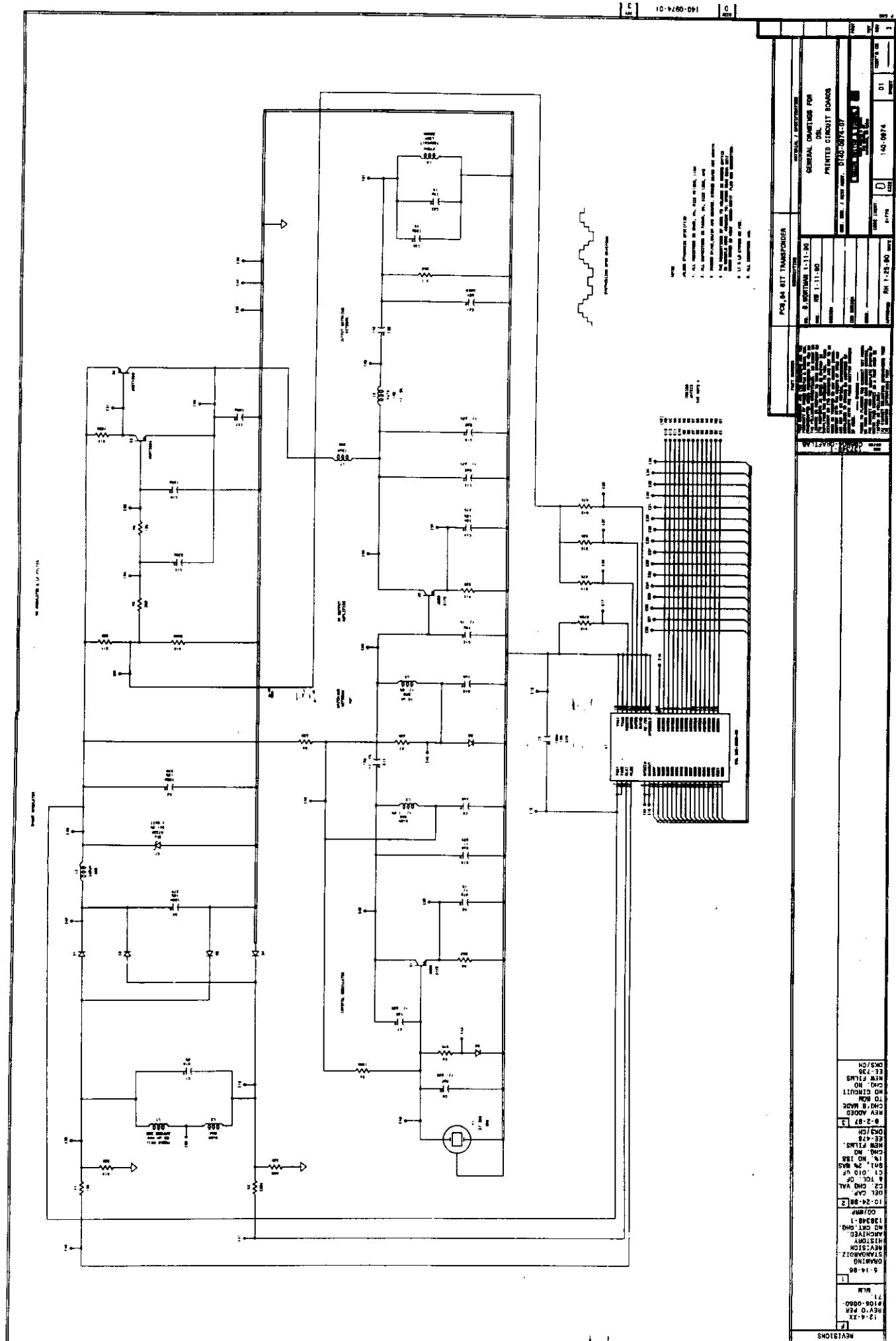
Enclosures

cc: Union Switch & Signal

97566.W112

Author: "Webber; Carrie L" <clwebber@switch.com> at Internet
Date: 02/19/1999 11:16 am
Priority: Normal
TO: DXM at FR-DC
Subject: FW: tx

> -----Original Message-----
> From: oetech@fccsun07w.fcc.gov [SMTP:oetech@fccsun07w.fcc.gov]
> Sent: Friday, February 19, 1999 11:08 AM
> To: clwebber@switch.com
> Subject: tx
>
> To: Carrie Webber, null
> From: Joe Dichoso
> jdichoso@fcc.gov
> FCC Application Processing Branch
>
> Re: FCC ID J8C2Z2TRANSPOUNDER
> Applicant: Union Switch & Signal Inc
> Correspondence Reference Number: 6209
> 731 Confirmation Number: EA92702
> Date of Original E-Mail: 02/19/1999
>
>
> We no longer have records of the device that you are applying for.
> Therefore, please submit information that is required with a new
> application. The information needed is listed in Section 2.1033. This
> includes photo's of the device, schematics, test report, users manual and
> a description of the device.
>
> The items indicated above must be submitted before processing can continue
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UNION SWITCH & SIGNAL 

A member of the ANSALDO Group
5800 Corporate Drive, Pittsburgh, PA 15237

SERVICE MANUAL 7020

User's Manual

DIGITRAC®

Train Location System

Asynchronous Serial Output
Issue 2

Formerly Dynamic Sciences Limited Document
Reference 176-0003-00

July, 1990
A-2/93-2992-1

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ANSALDO
Trasporti

NOTICE

Effective July, 1992, this document became the property of Union Switch & Signal Inc. All references to "Dynamic Sciences Limited" and "DSL" apply to Union Switch & Signal Inc.

For service on this Union Switch & Signal product, please contact:

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The Service Shop
645 Russell St.
Batesburg, SC
29006

Toll-Free Phone: 1-800-652-7276
Fax: 803-532-2940

INTRODUCTION

This manual gives an overview description of DIGITRAC®, the Transponder/Interrogator train location technology chosen for the Advanced Train Control System (ATCS).

DIGITRAC technology has been used in train service for many years. Its design objective was to utilize the most appropriate technology for the best possible accuracy and reliability in determining train location. No secondary applications were considered or included which might detract from the objective. It has been thoroughly tested and evaluated in many diverse applications and has an outstanding record of service.

During the process of selecting train location technology for the ATCS, several candidate systems were tested by the AAR at the Pueblo test track. DIGITRAC gave the best performance of all the equipment tested and this resulted in its selection and approval as the ATCS standard.

The equipment described in this manual is fully compliant with ATCS spec 335, except: i) data output to the user is asynchronous serial rather than HDLC; ii) data format is greatly simplified; and, iii) some connectors are different. For details on the fully compliant system, see manual 176-0000-00.

PROPRIETARY CONFIDENTIAL INFORMATION

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PATENT INFORMATION

Patents are issued on the equipment described in this manual.

In the USA, the following patent is issued:

Object Location/Identification System, Patent 3,898,619

REGISTERED TRADEMARK

DIGITRAC® is a Registered Trademark of DSL Dynamic Sciences Limited (United States Trademark Registration No. 1,158,953; Canadian Trademark Registration No. 252,080).

FCC ID: J8C2Z2TRANSPONDER
DIGITRAC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

Caution: Any modification to this device not expressly approved by Union Switch & Signal Inc. could void the user's authority to operate this device under Part 15 of the FCC Rules.

PREFACE

This manual is intended for reference by users and potential users of DIGITRAC. It contains all the information necessary to procure, install, and operate the equipment. Any changes which occur after the printing date will be issued on pink addendum sheets bearing the same document number. Questions regarding the manual should be directed to:

DSL Dynamic Sciences Limited
4279 Canada Way
Burnaby, B.C.
Canada V5G 4P1

Telephone: (604)437-1600
In U.S.: (800)663-8667
Fax: (604)439-1472
Telex: 04-352848 Vcr

This manual covers the following units:

Transponder	Model 6130	Order number 031-0012-00
Antenna	Model 6219	Order number 031-0110-00
Reader	Model 6501	Order number 031-0107-00
	8	031-0043-00

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- (a) Seller's liability in respect of any defect in or failure of the Products supplied hereunder, or for any loss, damage or injury attributable thereto, is limited to making good by repair or replacement, at Seller's discretion, defects which under proper use, care and maintenance, appear therein and arise solely from defective design, materials or workmanship, within a period of twelve (12) months from delivery, PROVIDED ALWAYS THAT:
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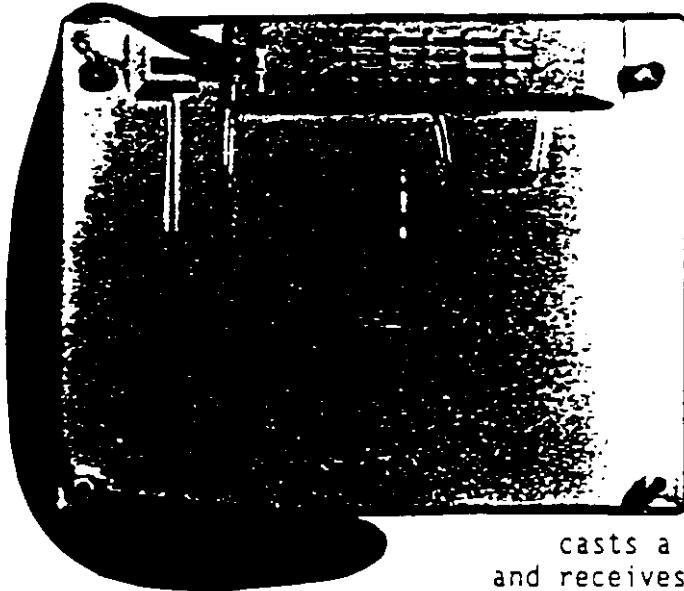
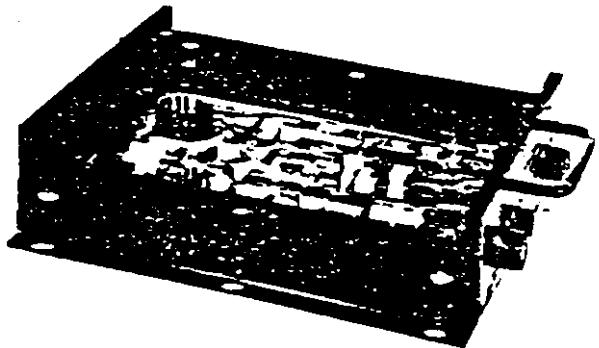
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DIGITRAC SYSTEM

DIGITRAC READER

The DIGITRAC Reader is a micro-computer-based data acquisition unit. It interfaces to vehicle power directly and supplies power to the antenna unit. Transponder data signals received by the antenna are demodulated in the reader and checked for integrity. After verification, the validated transponder number is available at the reader output interface.

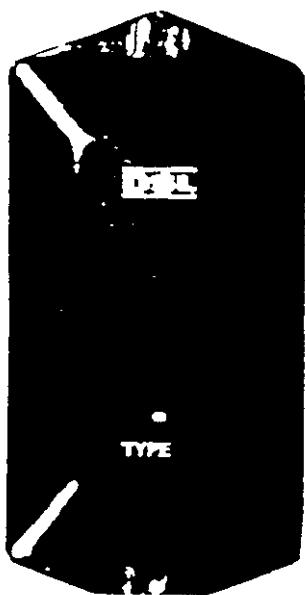


ANTENNA

The DIGITRAC antenna is a hermetically sealed unit which is normally mounted on the underside of the vehicle. It continuously generates and broadcasts a low power electromagnetic field, and receives transponder data transmissions.

TRANSPOUNDER

The DIGITRAC transponder is a small hermetically sealed unit which is normally mounted on the track roadbed at points where train location is required. When inductively energized the transponder continuously transmits binary data frames. BCH error check security techniques protect all transmitted data to ensure accuracy.



Section 1

General Information

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1.0 GENERAL INFORMATION

1.1 Introduction

The Digitrac System provides a means of data transfer between moving vehicles and the wayside. The data transfer occurs at fixed point locations precisely defined by the position of the equipment. DIGITRAC is designed primarily to provide location information from the roadbed to a locomotive, but can be inverted to pass information from vehicle to wayside. The flow of information is in one direction. The System can be used on any vehicle provided the path of travel of the vehicle can be closely controlled. This manual describes the system configuration for which the direction of information flow is from the wayside to the vehicle.

The mechanical design of the equipment is suitably rugged for the rigors of the transportation industry environment with its extremes of temperature, weather, and vibration. It has been used over a wide range of operating conditions in railroad and rapid transit applications. Powerful data acquisition techniques assure reliable and secure data transfer at vehicle speeds from zero to over 200 kph.

The system has been designed for flexibility of use and its output can readily be interfaced to other display, recording, or processing equipment. Applications include vehicle location, speed control, electronic sentry, route control, and trip recording.

1.2 System Description

The system comprises three elements:

- Transponder
- Antenna
- Reader

The block diagram in Figure 1 shows the system configuration of these elements.

The Transponder is a small hermetically sealed unit which transmits digital data only when inductively energized. It is normally mounted on the crossties between the rails at points where location is required. The transponder has a data capacity of either four or ten fixed decimal digits.

The Antenna is a rugged hermetically sealed unit which is normally mounted on the underside of the vehicle. It continuously generates and broadcasts a low power electromagnetic field at 200 kHz. When a transponder enters this field, its circuitry is energized and it transmits a modulated signal in the HF radio band. This signal is picked up by a receiving antenna located in the Antenna and is passed to the Reader.

The Reader is a rugged microprocessor-based data acquisition unit. It interfaces to the vehicle power directly, provides complete protection against input transients, and powers the Antenna. The received transponder data signal is demodulated in the Reader and checked for integrity. Data protection is provided by powerful BCH error check coding which virtually eliminates erroneous number acceptance. After data verification, the validated transponder number is available at the output interface in ASCII form. The interface may be either RS232 or RS422 compatible. Data format is serial asynchronous ASCII.

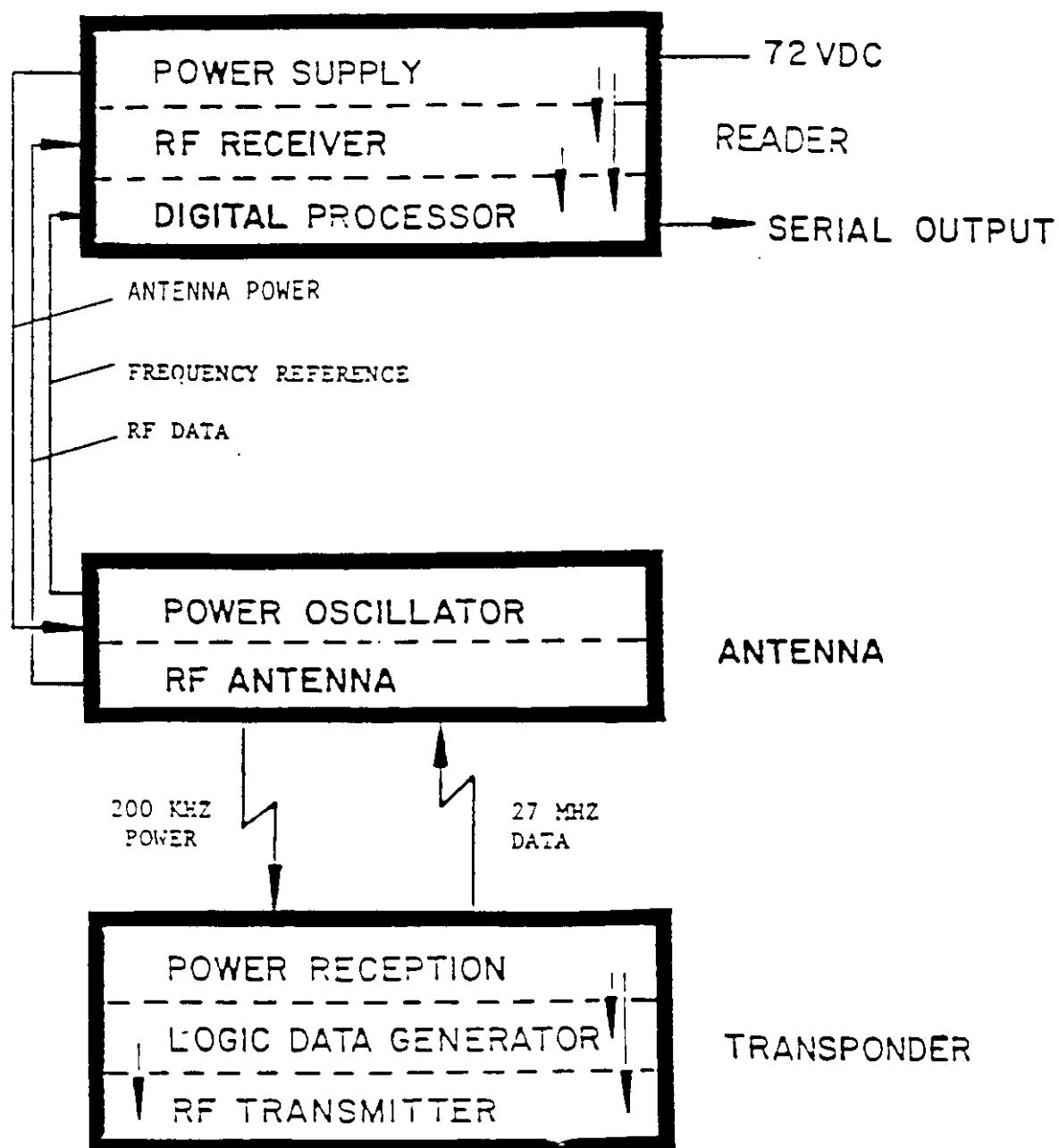


FIGURE 1 - DIGITRAC System Block Diagram

Section 2

Installation

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2.0 INSTALLATION

2.1 Transponder

The transponder may be mounted in any of the three configurations shown in Figures 2, 3 and 4. Figure 2 shows the preferred mounting with the transponder under a protective coverboard. This provides protection to the unit yet leaves it visible to avoid damage when track work is in progress. Ballast must be cleared from under the transponder during installation to avoid damage during track pumping.

The method of Figure 3 gives maximum protection from dragging equipment damage. The transponder must be securely anchored to the tie to prevent its moving and rotating as the ballast moves. It is vulnerable to inadvertent damage from aligning spikes, etc, as it is not readily visible to track workers.

Figure 4 shows the simplest method of mounting. The transponder is however exposed to damage from dragging equipment as well as loss or other damage. If the transponder is installed this way, a relatively flat tie must be selected to avoid stressing the transponder case when its mounting bolts are secured.

As in Figure 2, an optional protective coverboard may be installed if the tie is notched out as shown.

For all installations, the transponder fastening must not be rigid. The fasteners must have approximately +/- .05 inches of clearance from the sides of the mounting holes to accommodate the expansion and contraction of transponder length which occurs over the full operating temperature range.

It may be noticed during the installation that the transponder circuitry has some freedom of movement inside the case. This is as designed and is no cause for alarm.

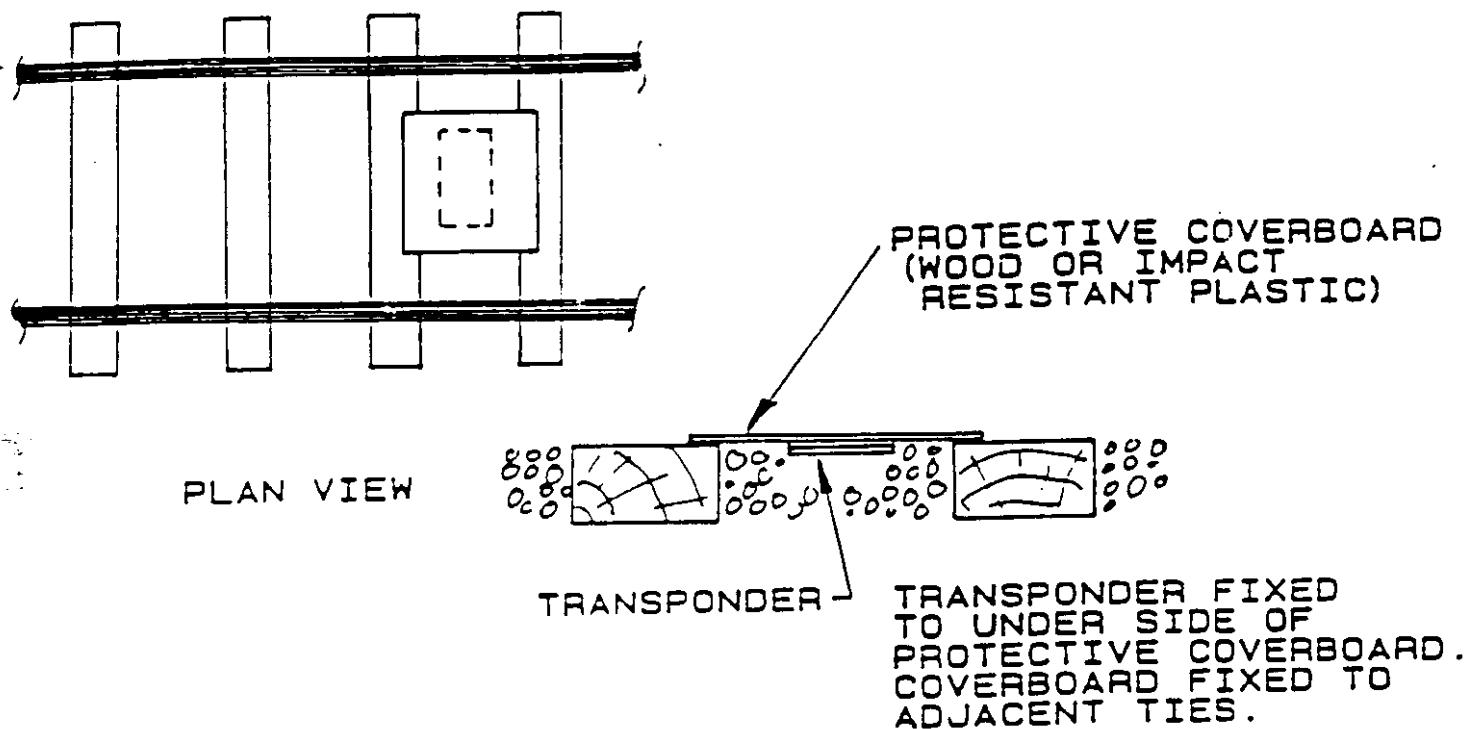
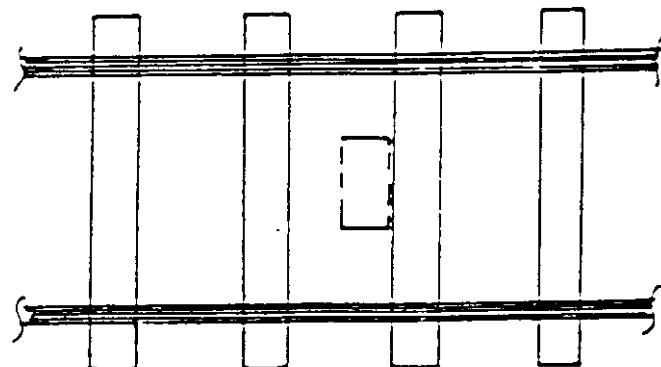


FIGURE 2 - Transponder Mounting Technique



TRANSPOUNDER BURIED
IN BALLAST WITH
FIXING BRACKET ON
CROSS-TIE.

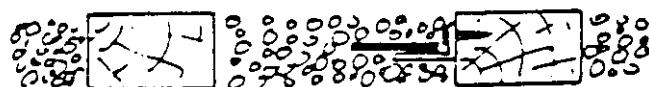


FIGURE 3 - Transponder Mounting Technique

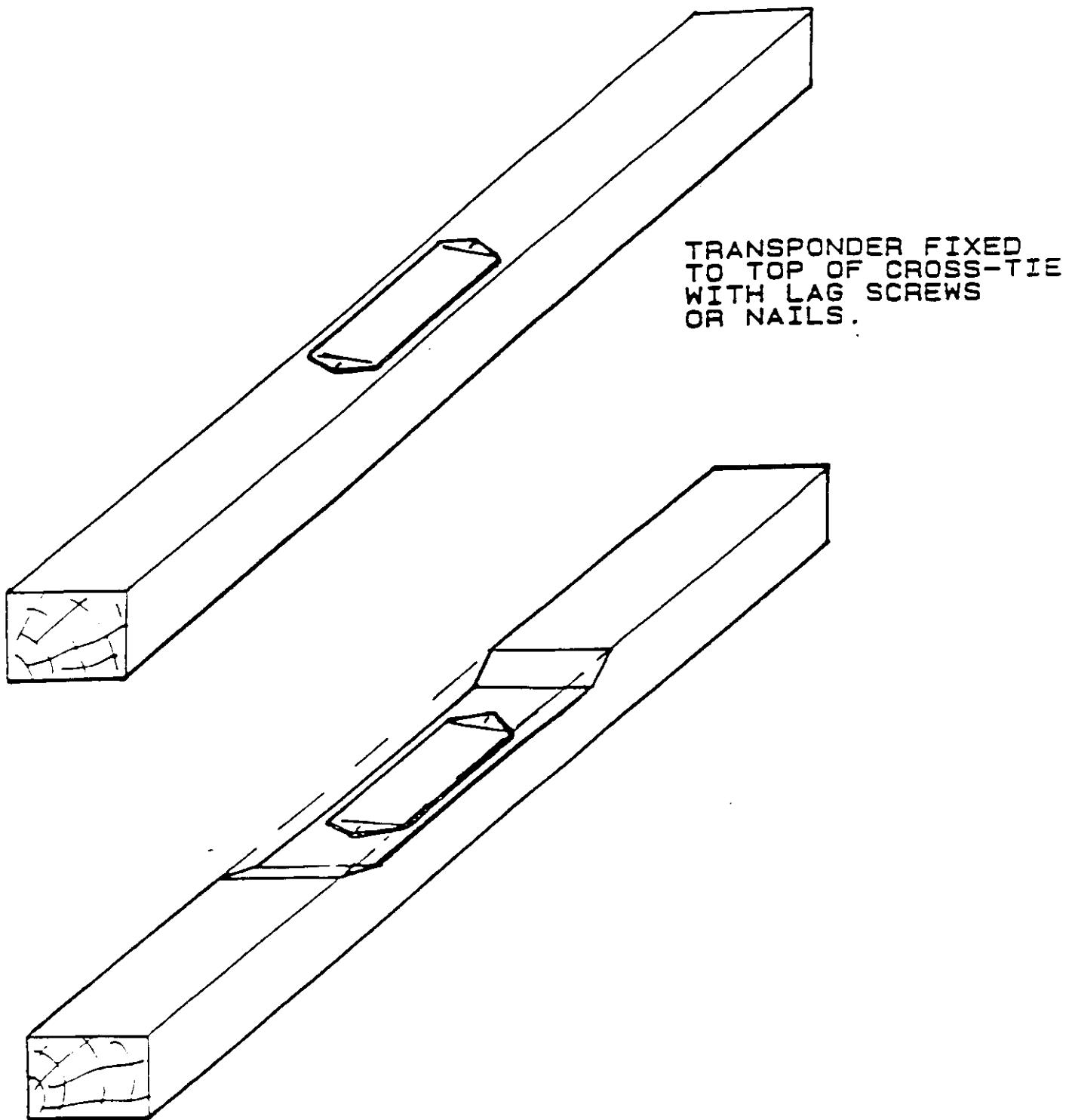


FIGURE 4 - Transponder Mounting Technique

2.2

Antenna

The Antenna is normally mounted ahead of the front wheel truck of the locomotive, under the short hood. It is protected in the direction of motion by the pilot. If no pilot is present then it is recommended that a baffle be welded onto the locomotive structure to provide the necessary protection.

Its principal plane is parallel to the transponders and therefore is parallel to the ground. Unless marked otherwise on the top surface, the longest dimension of the antenna should be in the direction of travel and the antenna centreline should be positioned above the centreline between the rails.

The Antenna is mounted through the four corner mounting holes. It must be ensured that the mounting frame and supports do not form a "shorted turn" which will electrically load the unit and cause a loss of performance.

The Antenna mountings should ideally be flexible or capable of pivoting, such that should the unit strike a very solid obstacle it can move out of the way rather than be destroyed. The unit should not be free to oscillate or sway under normal train motion.

A 20 foot cable is normally more than adequate to run from the Antenna to the radio locker in the locomotive. The cable should be tied down and anchored as securely as possible to avoid damage, especially where ice and compressed snow builds up under the locomotive. The top of the Antenna is especially designed to protect the cable connector. The cable should be tied down close to the antenna and then anchored to the corner support where it turns upward to the chassis.

2.3

Reader

The Reader is normally mounted in the radio locker. The Unit is water and corrosion resistant by virtue of epoxy paint, stainless steel hardware and a conformally-coated PCB. However, liquid sprays, chemical toilet compound or any corrosive agent should not be directed at or near the Unit.

The Reader is supplied with bulkhead mounting flanges. It may be mounted in any plane.

The Reader has LED indicators on the front panel showing power on, 200 kHz lock and data received.

Section 3

Operation

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3.0 OPERATION

3.1 Specifications

Specifications are included for the three system elements:

Transponder	-	Table 3-1
Antenna	-	Table 3-2
Reader	-	Table 3-3

SPECIFICATION

Item	Minimum	Typical	Maximum	Units
<u>Environmental</u>				
Operating Temperature Range	-40	-	+70	deg C
Storage Temperature Range	-55	-	+85	deg C
Vibration, 5-10 Hz	-	7.6	-	mm P-P
Vibration, 10-500 Hz	-	+/- 1.5	-	g P
Shock	-	20	-	g P, 11mS
Unaffected by snow, ice, dirt, water, at nominal separation between transponder and antenna of 12 to 14 inches.				
May be fully immersed.				
<u>Physical</u>				
Width	-	6.2(15.7)	-	In(cm)
Height	-	0.7 (1.8)	-	In(cm)
Length	-	12.8(32.5)	-	In(cm)
Weight	-	1 (0.5)	-	lbs(kg)
<u>Power Requirements</u>				
Nil - Powered by Inductive Coupling with Antenna.				
<u>Operating Range</u>				
Distance from Antenna Face	10(25)	13(33)	24(61)	In(cm)
<u>Data Transmission</u>				
Low power HF near-field propagation				
Complies with FCC Rules Part 15				
RF Carrier Frequency	27.247	27.255	27.263	MHz
RF Amplitude Modulation	50	60	70	Percent
DPSK Sub-Carrier		50		kHz
Data Rate		50		k Baud
<u>Data Capacity</u>				
Decimal Digits	-	10	-	
<u>Data Format</u>				
Per ATCS spec 335				
<u>Data Selection</u>				
Fixed at time of manufacture.				

TABLE 3-1 - Transponder Specifications (Model 6130)

SPECIFICATION

Item	Minimum	Typical	Maximum	Units
<u>Environmental</u>				
Operating Temperature Range	-40	-	+70	deg C
Storage Temperature Range	-55	-	+85	deg C
Vibration, 5-10 Hz	-	5	-	mm P-P
Vibration, 10-500 Hz	-	+/- 2.5	-	g P
Shock	-	20	-	g P, 11mS
Unaffected by snow, ice, dirt, water, at nominal separation between antenna and transponder of 12 to 14 inches.				
<u>Physical</u>				
Width	-	19.5(49.5)	-	In(cm)
Height	-	2.5 (6.4)	-	In(cm)
Length	-	24.5(62.2)	-	In(cm)
Weight	-	20 (9.1)	-	lbs(kg)
<u>Power Requirements</u>				
Supplied by Reader	55	-	85	Volts DC
		-	0.25	Amps
<u>Operating Range</u>				
Distance from Transponder	10(25)	13(33)	24(60)	In(cm)
Notes: 1) No conductive materials may be placed between the Antenna and Transponder, or within 6 inches (15 cm) of the Antenna.				
2) Two Antennae may not be placed closer than 10 feet (3 meters), if one or both are operating.				
<u>Power Transmission</u>				
Near Field Induction Coupling with Transponder. Complies with FCC Rules, Part 15.				
<u>Power Frequency</u>				
	190	200	210	kHz
<u>Connector</u>				
Cannon CA3106-E-18-1P-F80 (Model 6219 - flying lead per ATCS spec 335)				

TABLE 3-2 - Antenna Specification (Model 6219)

SPECIFICATION

Item	Minimum	Typical	Maximum	Units
<u>Environmental</u>				
Operating Temperature Range	-40	-	+70	deg C
Storage Temperature Range	-55	-	+85	deg C
Vibration, 5-10 Hz	-	7.6	-	mm P-P
Vibration, 10-500 Hz	-	+/- 1.5	-	g P
Shock	-	20	-	g P, 11mS
Suitable for physical and electrical environment of a locomotive.				
<u>Physical</u>				
Width	-	11.5(29)	-	In(cm)
Height	-	3.5 (9)	-	In(cm)
Length	-	16 (41)	-	In(cm)
Weight	-	12 (5.5)	-	lbs(kg)
<u>Power Requirements</u>				
Locomotive Power	55	70	85	Volts DC
	-	-	0.5	Amps
<u>Output Interface</u>				
EIA RS422 or EIA RS232-C Type Z Serial Asynchronous. Configured as DTE.				
Unit is user-configurable RS232 or RS422 by changing jumpers.				
<u>Output Data Format</u>				
Binary Coded Decimal or 8-bit ASCII no parity, 1 start bit, 2 stop bits.				
<u>Baud Rate</u>				
Jumper Selectable				
300	2400			
600	4800			
1200	9600 Baud			
<u>Connectors</u>				
Power: Cannon CA3102E-14S-5P-B-109				
Antenna: Cannon CA3102E-18-1S-B-109				
Communication: Cannon CA3102E-22-14S-B-109				
Pinout (all): See Dwg 031-0043-04 in Appendix A				

TABLE 3-3 - Reader Specifications (Model 6508)

3.2 Technical Description

3.2.1 Transponder

This transponder is an inductively powered data source designed to be used with the Antenna. The circuitry on the transponder can be divided into four sections:

- 1) 200 kHz power reception
- 2) Logic data generator
- 3) DPSK synthesizer
- 4) 27 MHz transmitter

The transponder is a sealed unit designed for long life and high reliability. It is not field serviceable. Should a unit fail to function properly it should be replaced or returned to the factory for repair.

3.2.2 Antenna

The Antenna uses DC power to drive the 200 kHz oscillator and thereby generates the 200 kHz electromagnetic field. This electromagnetic field is strong enough in the vicinity of the interrogator to energize the passive Transponder by inductive coupling. The Antenna provides circuitry to receive the high frequency transmission from the Transponder, as well as interface circuitry to the Reader for power, frequency reference, and RF data.

The Antenna is a sealed unit designed for high reliability in the severe environment under a locomotive. It is not field serviceable. Should a unit fail to function properly it must be replaced.

3.2.3 Interconnect Cable

The Antenna and Reader are joined by an interconnect cable carrying power, RF data and status. The cable is custom designed for the application and is neoprene jacketed for high resistance to oil and chemical contamination.

3.2.4 Reader

The Reader is a microprocessor-based data acquisition unit. It interfaces to the vehicle electrical system and the Antenna to which it supplies power and from which it receives a reference frequency and RF transponder data. It also passes validated transponder numbers to external equipment.

The circuitry for the unit can be divided into three sections:

- 1) Power Supply
- 2) RF Receiver
- 3) Digital Processor

The Reader is user servicable. Detailed information and the necessary drawings and instructions are supplied in the manual which can be supplied when equipment is shipped.

3.2.4.1 Input Power

The Reader operates by direct connection to the locomotive 74 Vdc electrical system. Presence of power is indicated by the POWER indicator on the Reader's front panel. The Reader's internal power supply provides both reverse polarity protection and spike/surge protection.

3.2.4.2 Communication Interface

422

The output of the Reader is serial RS42 or RS232-C (user configurable) type Z. Type Z means a user-defined interface. In this case, the request to re-transmit (RTR) is a custom feature. It allows for re-transmission of the latest transponder number in the event of transmission or reception error. An LSI universal synchronous or asynchronous receiver/transmitter (USART) U514 is used to generate serial asynchronous character data output under control of the Reader's micro-computer.

Refer to wiring diagram 031-0043-04 in Appendix A for communication connector pinout. Data rate is determined by a user-selectable jumper and may be 300, 600, 1200, 2400, 4800, or 9600 Baud.

Output Protocol

Refer to drawing 031-0043-68 which shows output timing.

When a verified transponder number is available for output, the Request To Send (RTS) line (active high) is activated. The Clear To Send (CTS) line is tied "on" (active low) so RTS results in immediate transmission of the output message at the selected Baud rate. After transmission, the RTS line is

de-activated and the transaction is complete. Receipt of Request-To-Retransmit (RTR), which is active high, activates the RTS line and causes the output transaction to take place as described above.

Output Message Format

The output characters comprise a 10-digit transponder ID number followed by line feed (LF) and carriage return (CR). The order of sending is ID numbers D1 through D10, LF, CR. Unless custom software has been supplied, the output message will conform to the standard software which produces 8-bit ASCII characters. Bit sequence is 1 start bit, 8-bit ASCII data sent LSB first (no parity), 2 stop bits.

3.2.4.3 Antenna

The Reader delivers 74 VDC power to the Antenna for generation of the 200 kHz field to power transponders within range. A sample of this frequency is returned to the Reader for phase reference. When the Reader locks onto this signal, the CARRIER LOCKED indicator is illuminated.

The Reader also receives the 27 MHz signal from the transponder through the Antenna. Whenever the signal from an approaching transponder reaches detection threshold, the DATA indicator flashes briefly and the encountered transponder's ID is output on the communication port.

Section 4

Test Equipment

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Antenna Load Meter	20
Mating Connectors	20

4.0 TEST EQUIPMENT

4.1 Introduction

The following test equipment is available to aid in maintenance, trouble-shooting and verifying correct operation of the DIGITRAC equipment.

- i) Antenna Load Meter Monitor
- ii) Mating Connectors

Instructions for the use of each item is included with the equipment as delivered. The following is a brief description of the functions and features.

4.2 Antenna Load Meter

The Antenna Load Meter is used to verify that the Antenna is properly installed and is not unduly loaded by surrounding metal or coils.

The meter is inserted between the Reader and its connecting cable to the Antenna. It shows the current and voltage supplied to the Antenna and enables verification that the current drain is not excessive.

4.3 Mating Connectors

The connectors that mate with the Digitrac 6508 Reader are available as single items, or complete with cables installed.

Power Cable 10 ft with 1 mating connector
Order number 031-0155-00
Antenna Cable 20 ft with 2 mating connectors
Order number 031-0109-00

Mating connectors to Reader

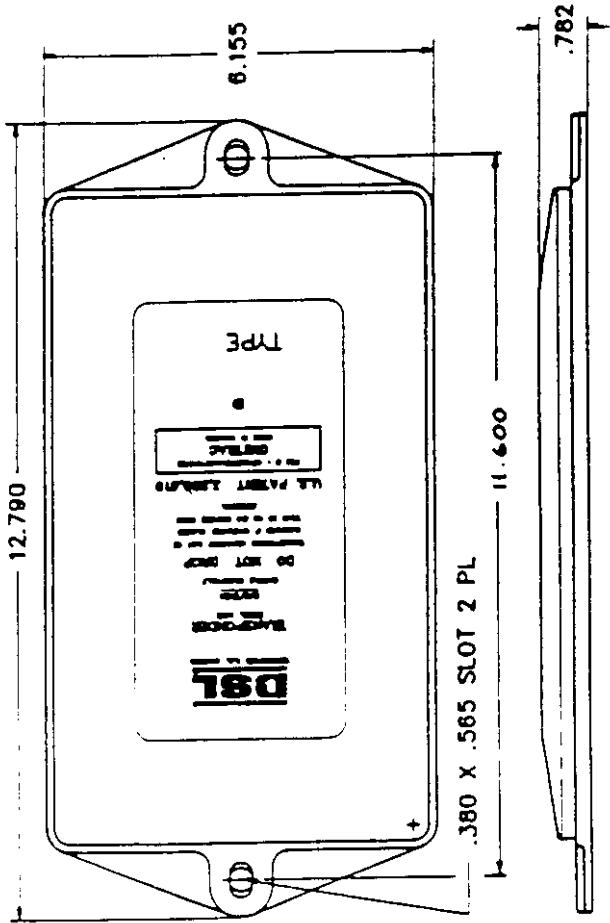
Power	CA3106E-14S-5S-B-F80	Order number 031-0044-00
Communication	CA3106E-22-14P-B-F80	Order number 031-0013-00
Antenna	CA3106E-18-1P-B-F80	Order number 310-2022-00

APPENDIX A
EQUIPMENT OUTLINE DIAGRAMS

031-0012-61 Transponder Outline
031-0110-61 Antenna Outline/Installation Drawing
031-0003-SIM Reader Outline
031-0043-04 6508 Reader Interconnect Diagram
031-0043-68 6508 Data Timing Diagram

FACILITY IDENTIFICATION			
DETAILS	INIT	DATE	

APPLICATION			
ITEM	ASSY	USED ON	LTR
1	ORIGINAL RELEASE	1/10/87	DW/DOORING/PB



DRAWN BY <i>DSL</i>	APR 77	REVIEWED BY <i>DSL</i>
SPECIFICATIONS CHECKED	1	PRINTED BY <i>DSL</i>
APPROVED	1	REVISION
MATERIAL	1	1
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		
DECIMAL 1		
XXX 1		
FRACTION 1		
ANGULAR 1		
DO NOT SCALE DWG		
DRAWING STATUS		
PERIOD	—	
PILOT	—	
REV	A	
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SION OF DSL UPON EVALUATION OR OTHER USEAGE AS AUTHORIZED IN WRITING BY		

DSL	DYNAMIC SCIENCES LIMITED
	MONTRÉAL <input type="checkbox"/>
	VANCOUVER <input checked="" type="checkbox"/>
TITLE	TRANSPONDER OUTLINE
DRAWING NO	B
REV	A

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS SHOULD BE AS LASHED AS PRACTICAL FROM ANY INTERNAL METAL SURFACE.

2. CONDUCTING MATERIALS MUST NOT CONNECT ANY MOUNTING RODS AT THE ANTENNA END.

3. SECURE THE ANTENNA TO THE MOUNTING RODS (SUPPLIED BY CUSTOMER).

4. SECURE CABLE TO MOUNTING RODS WITH CABLE TIE (SUPPLIED BY CUSTOMER) AS SHOWN.

5. SMALL METALLIC PROTRUSIONS WILL NOT IMPAIR THE PERFORMANCE OF THE SYSTEM.

16.0 19.5

DETAIL A

SUGGESTED MIG HARDWARE

B&L
ANTI-FIRE
WIRE 4208
Epoxy
Coated
Steel
Wire
Diameter
0.031
Inches
Length
100 ft
Spool
Weight
1.0 lb
Spool
Weight
1.0 lb

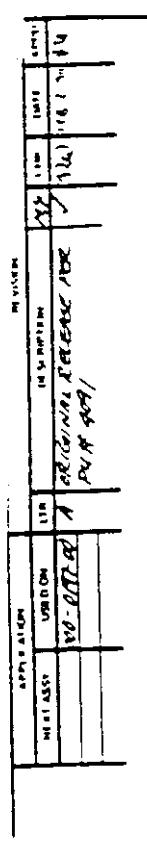
SHIELD (FRASERSON)
REINFORCED WIRE
TO PROTECT FROM
FLYING METAL
(SUPPLIED BY
CUSTOMER)

MOUNTING
HARDWARE
4 PL. SUPPLIED
BY CUSTOMER

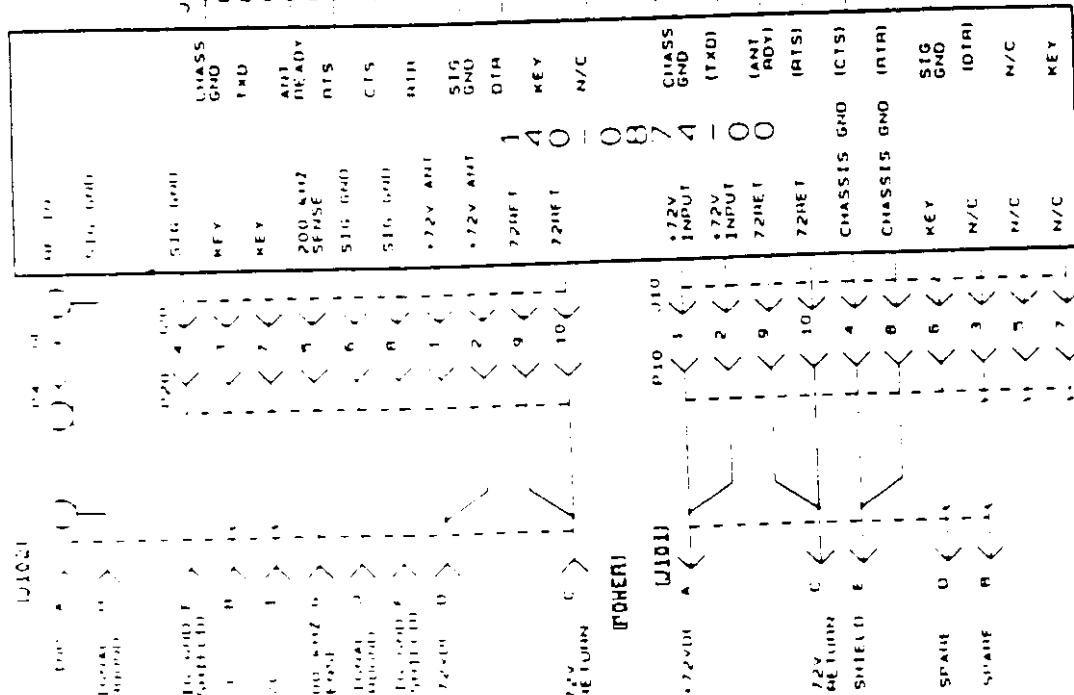
1/2 DIA. UNTHREADED RO
MIL
FLAT WASHER

ANTENNA

DIGITAL ATTACHMENT
SFC INSTALLATION
031-0110-01 REV B



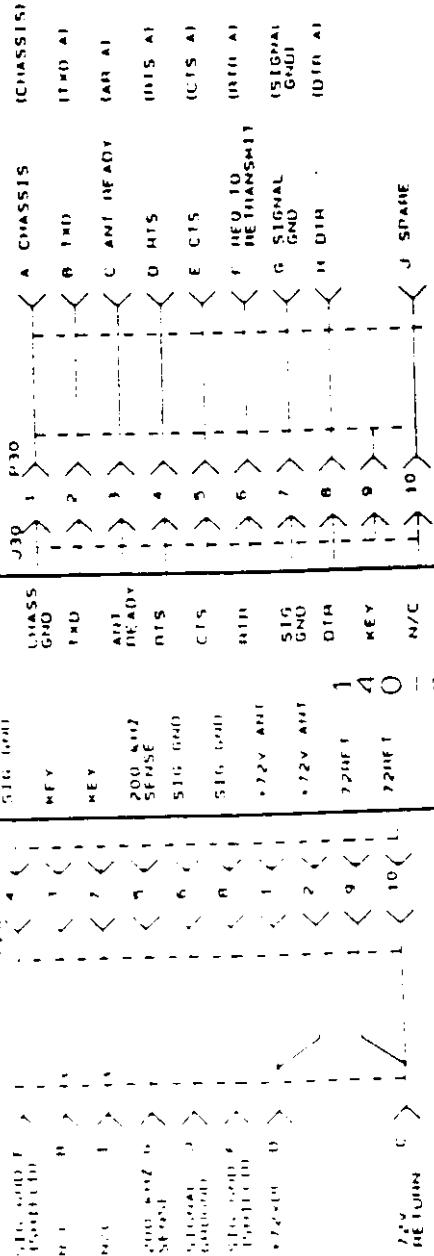
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COMMUNICATION 1

SCIENTIFIC
ILLUSTRATION

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FOIRES 23
COPPI 1000000
FOR 405-423



EUCHEN

DSL DYNAMIC SCIENCES LIMITED	
VANCOUVER ■ MONTREAL ■	
INTERCONNECT DIGITAL 6508	
DRAWING NO.	100-000-00
031-003 -	100-000-00
C	

POSITION IN WHICH EACH VEHICLE IS HELD

[6500] < - > 100

DATA
TRANSMISSION
TESTS

2000-2001

DATA COMMUNICATIONS

AM 510 3600 00001 (AU) AS INDICATED AUTOMATIC REPEAT REQUEST (ARQ) IS

A SYNCHRONOUS CHARACTER FORMAT: 1 START BIT,
 A IF A0 REMAINS HIGH THEN CB MUST BE BROUGHT
 A BEFORE END OF STOP BIT + 1mSEC ON SECOND
 A CHARACTER WILL FOLLOW IMMEDIATELY
 A 0.6 ONLY RECOGNIZED WHEN BOTH CA AND CB LOW.
 A 0.0 HIGH INDICATES THAT 6500 IS READY
 A TO COMMUNICATE

IN QUEST TO SEND GENERATED EITHER FROM NEW TRANSPONDER ENCOUNTERED OR AUTOMATIC REPEAT REQUEST (ARQ) AS INDICATED BY SIGNAL QUALITY LINE

APPLICATION NUMBER	NEUTRAL	NEUTRAL	NEUTRAL	NEUTRAL
MANUFACTURER	11/1970	11/1970	11/1970	11/1970
DESCRIPTION	1000-000	1000-000	1000-000	1000-000
MANUFACTURE DATE	11/1970	11/1970	11/1970	11/1970
EXPIRATION DATE	11/1970	11/1970	11/1970	11/1970
APPROVAL DATE	11/1970	11/1970	11/1970	11/1970