SITE OPERATIONS AND MAINTENANCE MANUAL SANITARY TRANSFER AND LANDFILL DELAFIELD, WISCONSIN

Project Number 2096

1135 Legion Drive
Elm Grove, Wisconsin 53122

K. SINGH & ASSOCIATES INCORPORATED

Engineers and Environmental Management Consultants

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Milwaukee WI

SITE OPERATIONS AND MAINTENANCE MANUAL SANITARY TRANSFER AND LANDFILL DELAFIELD, WISCONSIN 53018

PREPARED FOR

THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES
4041 N. RICHARDS STREET
P.O. BOX 12436
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PREPARED BY

K. SINGH & ASSOCIATES, INC.
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JOB # 2096

JANUARY 20, 1993

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January 20, 1993

Mr. Roger Klett
WDNR-Southeastern District Headquarters
P.O. Box 12436
Milwaukee, WI 53212

Project # 2096

Subject : **Site Operations and Maintenance Manual for Sanitary Transfer and Landfill, Delafield, Wisconsin**

Dear Mr. Klett:

As requested by the Department, a revised Site Operations and Maintenance Manual has been prepared for the referenced project. This manual incorporates all the changes requested by Ms. Marie Stewart as per the fax message received on January 14, 1993.

As discussed in our telephone conversation on January 19, 1993, the scope of the manual has been expanded to include details on tank installation, construction of the concrete loading deck, groundwater, gas and leachate monitoring requirements, and site health and safety plan. A detailed description of the leachate collection and remote monitoring system layout and operation is also included.

We appreciate this opportunity to provide engineering services. If you have any questions regarding the project or this manual, please call.

Sincerely,

K. SINGH & ASSOCIATES, INC.

Raghu B. Singh
Raghu B. Singh, Ph.D.
Project Scientist

Ravi Narayanan
Ravi Narayanan
Project Engineer

cc: Ms. Marie Stewart / WDNR, Madison

SITE OPERATIONS AND MAINTENANCE MANUAL FOR THE SANITARY TRANSFER AND LANDFILL DELAFIELD, WISCONSIN

PREPARED FOR

THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES
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JANUARY 20, 1993

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SECTION I. INTRODUCTION

1.1 PROJECT BACKGROUND

The Sanitary Transfer and Landfill is located in Sections 22 and 27, Township 7 North, Range 18 East, in the City of Delafield, Waukesha County (Figure 1). The landfill was reportedly closed over 10 years ago, and is under post-closure monitoring and maintenance program.

Wisconsin Department of Natural Resources retained K. Singh & Associates, Inc. in June 1992 for post closure monitoring and maintenance of Sanitary Transfer and Landfill, Delafield. Post-closure maintenance and monitoring consists of maintenance of the clay cover, mowing of grass, pumping of leachate, and groundwater and methane gas monitoring.

Nine on-site groundwater monitoring wells and one leachate manhole are monitored semi-annually. Groundwater elevations in these wells are measured quarterly. In addition, seven, fourteen and one off-site private wells are monitored quarterly, semi-annually, and annually respectively. The location of on-site and off-site monitoring wells are shown in Figure 2 (refer to Appendix A).

The leachate manhole is located at the southeast corner of the landfill. The leachate from the leachate manhole is pumped into a 6,000 gallon storage tank. Reportedly, this tank fills up within 12 to 14 hours in winter months and 5 to 6 hours in spring months. Leachate from 6,000 gallon tank was sent to a 2,000 gallon tank through gravity feed. A manual valve was used to regulate leachate flow into the 2,000 gallon tank. The location of the 6,000 and 2,000 gallon tanks and leachate collection manhole are shown in Appendix A (refer to Figure 3). A revised site survey map is under preparation by Uttech Land Surveying, Beaver Dam, Wisconsin.

Leachate from 2,000 gallon tank was pumped daily by private sub-contractor. The manual valve was opened to allow leachate flow into 2,000 gallon tank. From this tank the leachate was pumped into a tanker. After the tanker was full, the manual valve was closed to prevent overflow of 2,000 gallon tank. The leachate was disposed of to the City of Waukesha Wastewater Treatment Plant. Approximately, 6,000 gallons of leachate was pumped daily Monday through Friday, with the exception of wet weather conditions when leachate was pumped during weekends too.

An additional 10,000 gallon leachate collection tank was proposed to be installed to provide additional capacity, which may limit pumping of leachate during weekdays.

Ms. Marie Stewart of Wisconsin Department of Natural Resources sent a letter to K. Singh & Associates, Inc., on April 22, 1992 regarding preparation of technical specifications for installation of a 10,000 gallon leachate collection tank and remote monitoring and auto alarm system (1). The technical specifications for upgrading the leachate collection system was prepared and submitted in October 1992, in response to the agreement reached between the WDNR and K. Singh & Associates, Inc. in June 1992. The 10,000 gallon leachate collection tank, the concrete loading deck, and the remote monitoring system were installed in December 1992. Figure 4 shows the schematic layout of the leachate collection and the remote monitoring system.

This manual is prepared to provide a summary of the system construction, operation and

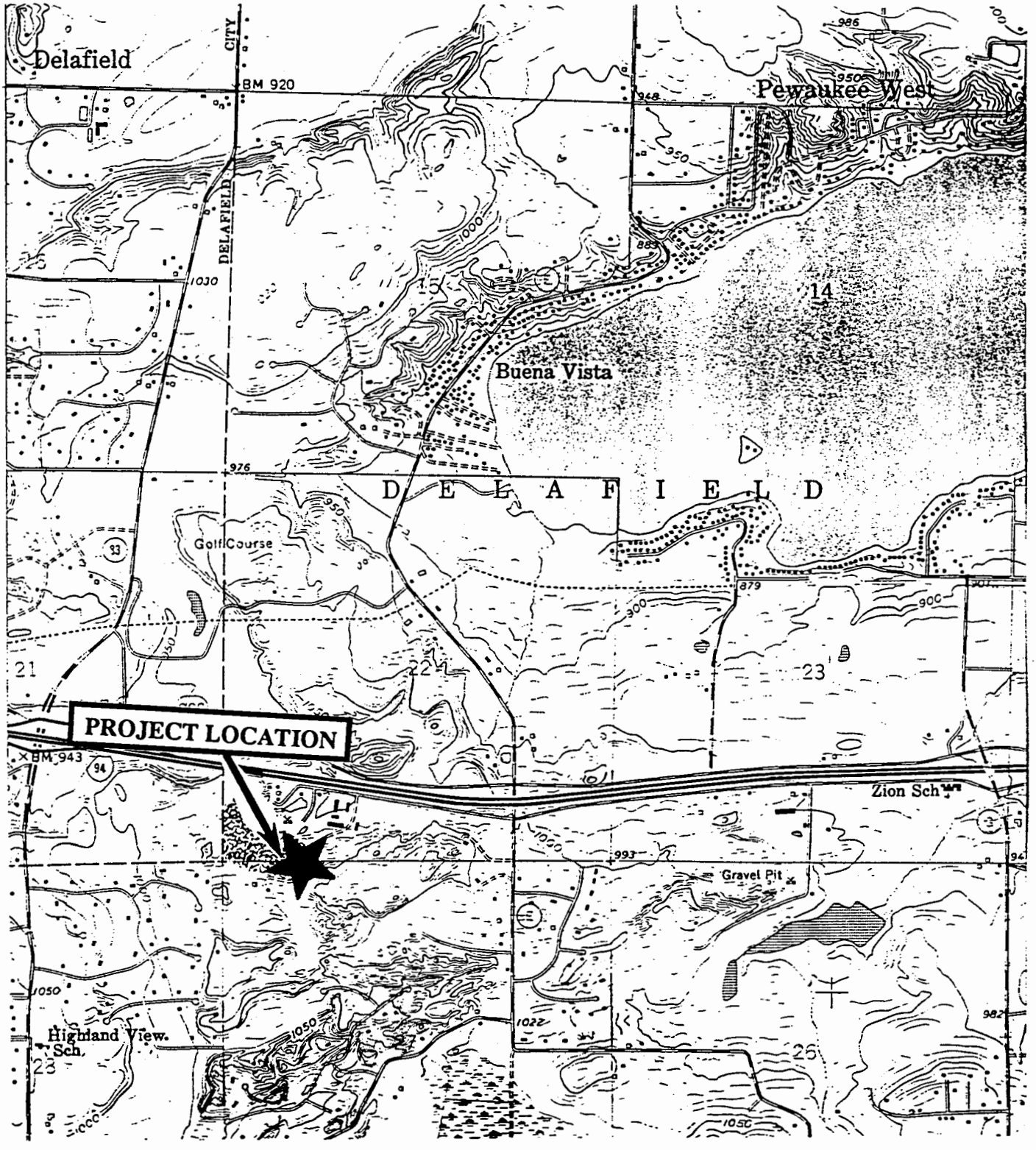


Figure 1. Project Location Map

Scale: 1" = 2000'

K. SINGH & ASSOCIATES, INC.

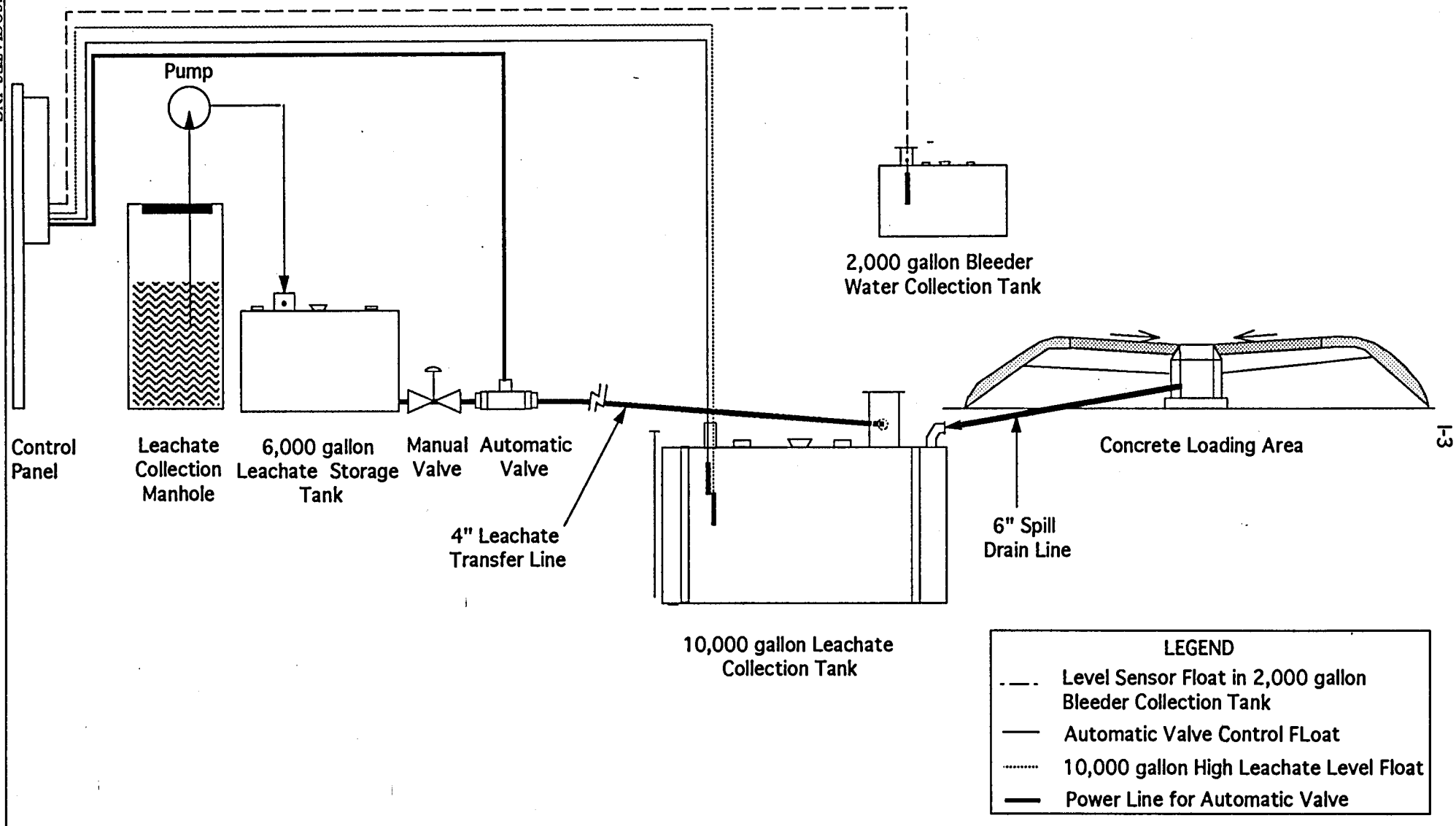


Figure 4. Schematic of Leachate Collection and Monitoring System

maintenance required for post-closure monitoring of the referenced facility. It includes a detailed outline of groundwater and gas monitoring requirements as well as a detailed description of the leachate collection system construction, operation and maintenance. Landfill maintenance requirements along with emergency plans and procedures, and a site safety plan are also included in the manual.

1.2 PURPOSE AND SCOPE

This manual is prepared to provide a summary of the systems operations and maintenance required for post-closure monitoring of the referenced facility. It includes the following:

1. Outline of groundwater and gas monitoring requirements,
2. Construction, installation, and maintenance of 10,000 gallon leachate collection tank,
3. Construction of loading deck,
4. Description of leachate collection system,
5. Description of remote monitoring system,
6. Landfill maintenance requirements, and
7. Site health and safety considerations.

1.3 REPORT ORGANIZATION

This report is organized into eight sections. Section I describes project background, scope of work, and report organization. Section II includes a description of groundwater, leachate, and gas monitoring program. Section III includes construction details and installation of concrete slab, 10,000 gallon leachate collection tank, automatic valve, and leachate transfer line. Section IV includes a description of the leachate management system. Section V describes the site maintenance requirements. Section VI includes description of site health and safety measures. Section VII, and VIII includes conclusions, and references, respectively. Section IX lists the appendices.

SECTION II. MONITORING PROGRAM

2.1 GENERAL

The environmental and performance monitoring program for the landfill consists of:

- Groundwater monitoring wells
- Leachate collection tanks
- Gas monitoring wells
- Gas extraction system
- Landfill cover
- Access road maintenance

Semi-annual sampling activities and analyses are performed during the months of June and December. These activities include:

- Sampling of 9 on-site wells
- Sampling of one leachate manhole wetwell
- Sampling of 22 off-site private residence wells
- Monitoring of 17 gas probes
- Monitoring of blower inlet, and
- Monitoring of eight gas vents

Water quality data are reported quarterly to the Department by the use of turn-around documents (TADs). Data not entered on the TADs are provided as an attachment to the TADs.

2.2 GROUNDWATER MONITORING

The on-site groundwater monitoring wells listed in Table 1 are monitored semi-annually for the parameters indicated on parameter List #1 shown in Table 2. The off-site private wells are sampled quarterly and semi-annually as indicated in Table 1. Private wells are sampled for the List #2 parameters indicated in Table 2. The names and telephone numbers of the owners are included in Table 3. Well locations are shown on the site survey map in Appendix A (refer to Figures 3 and 4).

Groundwater monitoring wells listed in Table 1 are purged and sampled consistent with the requirements of the WDNR. Field duplicates are also taken at a frequency of one for each 10 wells sampled.

Field pH, specific conductance, and temperature are measured each time a monitoring well is sampled. Turbidity, color and odor are also noted. Chain of custody documents are completed and samples returned each day to a WDNR certified laboratory.

2.3 LEACHATE MONITORING

Concurrent with groundwater monitoring well sampling, samples are also collected from the leachate manhole, and upon receipt of samples at the laboratory, each sample is analyzed for the parameters in List #3 of Table 2.

Table 1
Groundwater Monitoring Wells
Sanitary Transfer and Landfill, Delafield, Wisconsin

Well Designation	Sampling Frequency	Groundwater Elevation	Parameter List**
On-site Wells			
E-3BR	Semi-annual	Yes-Q*	1
E-2	Semi-annual	Yes-Q*	1
E-4	Semi-annual	Yes-Q*	1
E-5	Semi-annual	Yes-Q*	1
E-6	Semi-annual	Yes-Q*	1
E-6B	Semi-annual	Yes-Q*	1
E-7	Semi-annual	Yes-Q*	1
E-8	Semi-annual	Yes-Q*	1
LP 2	Semi-annual	Yes-Q*	1
Leachate MH	Semi-annual	Yes-Q*	1
Off-site Wells			
PW-4	Quarterly	------	2
PW-5	Semi-annual	------	2
PW-11	Quarterly	------	2
PW-13	Quarterly	------	2
PW-14	Semi-annual	------	2
PW-15	Semi-annual	------	2
PW-16	Semi-annual	------	2
PW-17	Semi-annual	------	2
PW-21	Quarterly	------	2
PW-54	Semi-annual	------	2
PW-55	Semi-annual	------	2
PW-91	Quarterly	------	2
PW-92	------	------	--
PW-94	Quarterly	------	2
PW-95	Semi-annual	------	2
PW-96	Quarterly	------	2
PW-97	Semi-annual	------	2
PW-99	Semi-annual	------	2
PW-100	Semi-annual	------	2
PW-101	Semi-annual	------	2
PW-102	Semi-annual	------	2
PW-103	------	------	--
PW-104	Annual	------	2
PW-105	Semi-annual	------	2
PW-106	------	------	--

Note: * Denotes quarterly; ** Refer to Table 2; ------ denotes abandoned wells

Table 2
Parameter Analysis List
Sanitary Transfer and Landfill
Delafield, Wisconsin

PARAMETER LIST NO. 1

** Filtered as needed
Field conductivity corrected to 25 degree Celsius
Field pH
Total Alkalinity
Nitrate plus nitrite nitrogen
Total Kjeldahl Nitrogen
Chloride
Total Hardness
Chemical Oxygen Demand (COD)
Dissolved Manganese
Dissolved Iron

PARAMETER LIST NO. 2

** Unfiltered
Field conductivity corrected to 25 degree Celsius
Field pH
Total Alkalinity
Nitrate plus nitrite nitrogen
Total Kjeldahl Nitrogen
Chloride
Total Hardness
Chemical Oxygen Demand (COD)
Total Manganese
Total Iron

PARAMETER LIST NO. 3

** Unfiltered
Field conductivity corrected to 25 degree Celsius
Field pH
Total Alkalinity
Nitrate plus nitrite nitrogen
Total Kjeldahl Nitrogen
Chloride
Total Hardness
Chemical Oxygen Demand (COD)
Total Manganese
Total Iron
Biological Oxygen Demand (BOD)
Suspended Solids

Table 3
List of Private Wells

Well #	Owner	Telephone	Address
PW-4	Mark Dulek	646-4258	N9 W31054, Concord. Ct.
PW-5	Ron Nichols	----------	S. Frontage Road / Nichols Blue Storage Bld.
PW-11	John Troka	646-4306	N11 W31230, Bunker Hill
PW-13	Degonda	646-2333	W311 N1052, Fairfield Way
PW-14	Ray Schenk	646-8596	N9 W31186, Concord. Ct.
PW-15	Jim Lofy	646-8812	N9 W31146, Concord. Ct.
PW-16	R. Rummel	646-3959	N9 W31104, Concord. Ct.
PW-17	Mel Laabs	646- 3815	N9 W31078, Concord. Ct.
PW-21	Kremslehner	646-2886	N11 W31276, Fairfield Way
PW-54	Kuenhold Sitarz	646-2204	W312 N1055, Fairfield Way
PW-55	Mike Schroeder	646-8775	N11 W31247, Fairfield Way
PW-91	Paul Stephen	646-2205	W30795 S. Service Road
PW-92	Abandoned in 1982 from Stephen Auto Body Shop		
PW-94	Jim Brown	646-2351	W307 N1497, Hwy CCC
PW-95	Townhall	646-2398	N14 W30782, Hwy CCC
PW-96	Ted Todd	646-2397	N15 W30921, Hwy CCC
PW-97	Schade Contracting	646-5400	E 2831, Golf Road
PW-99	R. Fera		2711 Golf Road
PW-100	Hardees Restaurant	----------	I-94 & Hwy 83
PW-101	Family Chef Restu.	646-2737	2400 Milwaukee Street
PW-102	Amoco Standard	646-3997	2675 Sun Valley Dr.
PW-103	Sun Valley Motel	Abandoned	2553 Sun Valley Dr.
PW-104	Marty's Pizza	646-3327	2580 Sun Valley Dr.
PW-105	PDQ	646-8827	2694 Sun Valley Dr.
PW-106	Former Delafield Inn. abandoned		

2.4 GAS MONITORING

Methane gas data from past sampling events are examined to evaluate trends. Concurrent with groundwater monitoring well sampling activities in March and September, the gas probes and vents listed in Table 4 are monitored for methane gas. Methane gas monitoring activities are performed in accordance with the plan modification approval for the facility dated August 20, 1982. Locations of the gas monitoring wells are shown on the site survey map in Appendix A (refer to Figure 4).

2.5 REPORTING REQUIREMENTS

A weekly report on gas and leachate monitoring is submitted to the WDNR Project Manager. Groundwater quality test results along with the comments are sent to WDNR after each sampling. In addition, a annual report is submitted to the Department. The annual report will document the groundwater quality, leachate management, functioning of the 10,000 gallon tank including the controls systems, and maintenance of the landfill cover. The report shall include the following:

a. Performance of the gas extraction system.

b. Any maintenance, cleaning, repair, or replacement of extraction wells, header or lateral times, blower or gas combustion equipment components, or valve assemblies.

c. Any blockage of header lines, operation of the buried service valves, clogging or flooding of header lines, or excessive differential settlement of the header line alignment as defined by site inspections.

d. Any proposed changes to the environmental or performance monitoring due to changes in the gas generation rate, changes in the gas quality, or other site behavior.

e. Vegetative cover vigor and diversity, animal intrusion, soil slumping or exposure of the capping layer, integrity of surface swales and other drainage features, and any evidence of water ponding or formation of depressions.

f. All environmental and performance monitoring data required by this approval will be submitted to the Department at quarterly intervals. Data which are not recorded on turn-around documents (TADs), such as volume and gas quality data, shall be submitted with the TAD as an attachment until such time as the Department develops a reporting form for such data.

Table 4
Gas Monitoring Locations
Sanitary Transfer and Landfill, Delafield, Wisconsin

PROBES	VENTS
D-4	G-1
D-5	G-2
D-8	G-3
D-9	G-4
D-16	G-5
D-17	G-6
D-19	G-7
D-20	G-8
D-21	
D-22	
D-23	
D-24	
D-25	
D-26	
D-27	
L-1	
L-2	
V-1 to V-12	
Blower Inlet	

SECTION III. INSTALLATION OF LEACHATE COLLECTION SYSTEM

3.1 INSTALLATION OF CONCRETE SLAB

On November 30, 1992, the concrete slab was installed as per the "Technical Specifications for Installing Leachate Collection System", submitted to WDNR on October 16, 1992.

Figure 5 shows the construction details of the concrete slab. The concrete slab was constructed by Vydrzal Service, Inc. As shown in the figure, the existing grade was leveled, and the fill from the tank excavation was backfilled upto 3 feet above grade, performed in one foot lifts. A one foot layer of pea gravel was then overlain on the fill layer. A 6 inch thick, 15 feet by 60 feet fiber mesh reinforced concrete pad was then poured. The slab's surface slopes at 1% from all directions to a type 1C inlet installed at the center of the pad. Three equally spaced transverse contraction joints were sawed to a depth of 1-1/2 inches for the width of the pad. A 6 inch schedule 80 PVC pipe was run from the bottom of the inlet to a 6 inch flange inlet manifold on the 10,000 gallon tank. This line serves to transfer any accidental spills on the concrete slab into the 10,000 gallon tank.

After partial curing for 4 hours the slab was covered with bales of hay till curing was complete. A sample was analyzed for 21 and 28 day compression strength, by Wisconsin Testing Laboratories, Menomonee Falls. The average 21 and 28 day strength of the concrete was determined to be 6,155 psi. and 6,775 psi., respectively. The test report is included in Appendix B. Photographs of the construction of the concrete slab are included in Appendix C.

3.2 TECHNICAL SPECIFICATIONS OF THE TANK

The 10,000 gallon leachate collection tank was supplied by Usemco Inc., Tomah, Wisconsin. It is 21 feet long and 9 feet in diameter. The tank is of double wall construction built to UL and STI Standards. The tank interior is built out of 1/4 inch thick plate with a outer wrap is made out of 3/16 inch thick plate. Two 1/4 inch thick striker plates one 30 inch by 30 inch and the other 8 inch by 22 inch are placed at the bottom of the tank, diametrically opposite the 24 inch manhole and the 4 inch pipe, respectively.

The tank has a 15 mils thick Corrocote II coating on the heads and a 10 mils thick Corrocote II coating on the shell. The tank interior has two coats of total 16 mils thickness of Koppers 300 M coating. Figure 6, appended in Appendix D shows the technical drawing of the tank.

3.3 TANK TESTING

The tank was delivered on-site on December 21, 1992. After unloading the tank on level surface, supports were placed to prevent tank roll over. Midwest Petroleum Service, Inc., West Allis, Wisconsin then performed air tightness test on the tank. All the ports on the tank were sealed, and the main body of the tank was pressurized at 4 pounds per square inch. The inlet air valve was then shut off and the pressure gauge on the tank was monitored for any pressure drop for one hour. During this period the sides of the tank, and all the welded surfaces, and fittings were sprayed with foam, to detect leaks, if any. After noting that there were no tell tale signs of leaks or that there was no pressure drop noted at the pressure gauge,

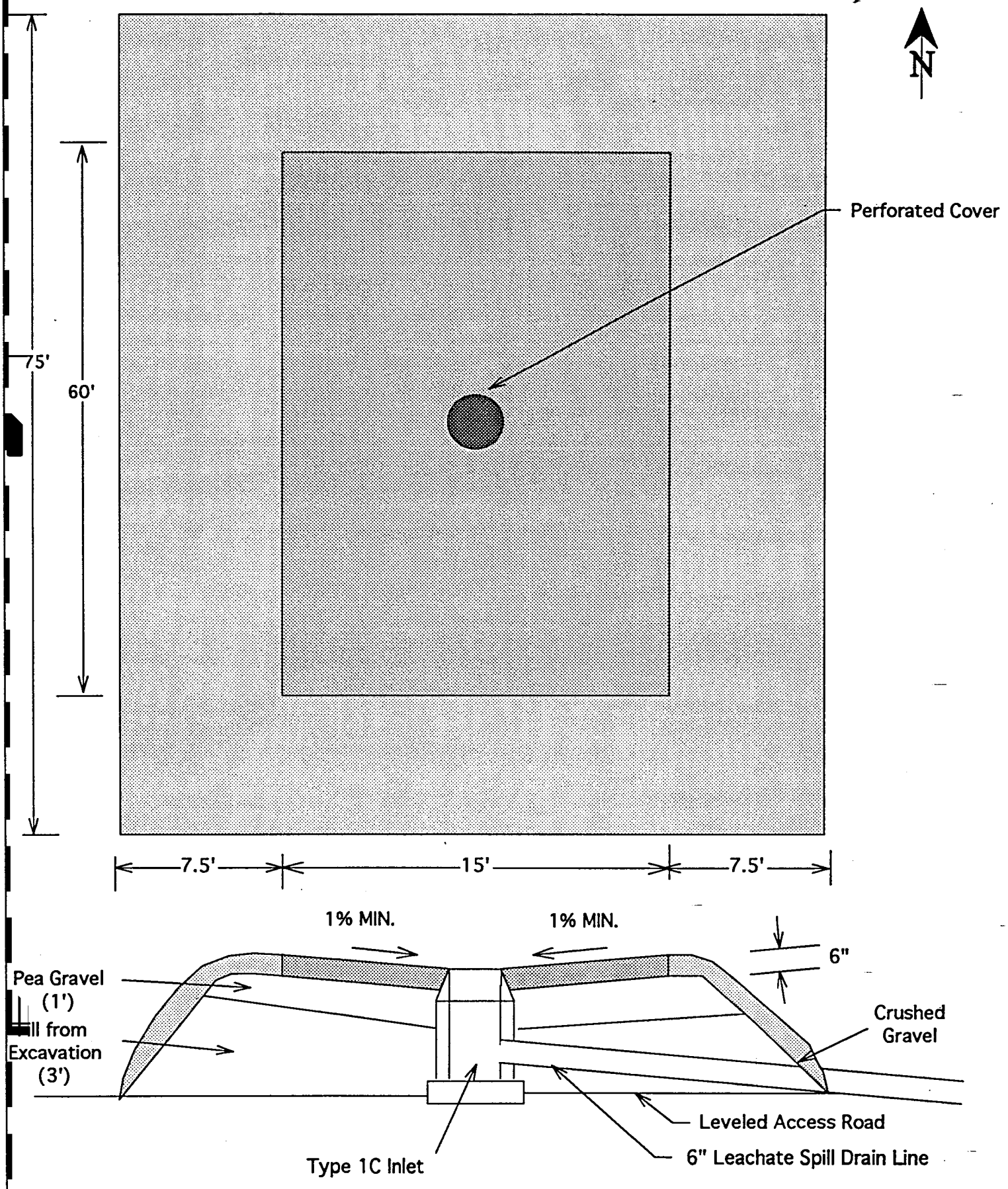


Figure 5. Plan and Elevation of Concrete Slab

the tank was de-pressurized slowly over 20 minutes.

The interstitial space was then similarly checked for tightness. No leaks in the tank or pressure drop at the gauge were noted.

3.4 INSTALLATION OF THE TANK

The excavation for installing the tank was commenced on November 30, 1992 and completed on December 8, 1992. The tank was installed by Vydrzal Service, Inc. The guidelines recommended by American Petroleum Institute for installing underground storage tank was followed (2). The manufacturer supplied installation instructions are appended in Appendix C. Figure 7 shows the plan and elevation of the tank excavation and the concrete slab and bedding. The excavation for installing the tank was approximately 15 feet deep. The excavation was 26-1/2 feet long and 15 feet wide at the top of the excavation. The excavation was sloped approximately 9^0 to mitigate cave-ins. The excavation was approximately 24 long and 12 feet wide at the base. A one foot layer of pea gravel was placed at the base of the excavation, and compacted. An 18 inch thick, 23 feet long, and 12 feet wide concrete slab with #4 bars 1' O.C in each direction was then poured on the pea gravel layer. Four anchor bolts were anchored on the concrete slab for securing the tank restraints. These bolts were 9 feet apart on each end of the slab. After the concrete had cured, a 10 inches thick layer of pea gravel was then overlain on the concrete slab. Photographs of tank installation are shown in Appendix C.

A sample was analyzed for 21 day compression strength, by Wisconsin Testing Laboratories, Menomonee Falls. The average 21 day strength of the concrete was determined to be 6,707 psi. The test report is included in Appendix B.

The tank was then lowered into the excavation, and placed at the center of the concrete slab. The tank level was checked using a laser leveling system. The tank was level to within 0.05 feet.

Anchor straps were then placed on insulating bands and the tanks were secured on the anchor bolts. As per the manufacturer's recommendation, five zinc anodes located on the tanks were wetted thoroughly with water. The excavation was then backfilled with pea gravel up to 1 foot above the tank body. Special care was taken while backfilling the bottom of the excavation to ensure that the tank is evenly supported around the bottom quadrant.

A 10 inch diameter, 15 feet deep sump with 10 feet of screen was installed at the south-west corner of the excavation to pump accumulated water in the tank excavation.

Six inch diameter well covers were installed over the 2 inch diameter interstitial monitor port and a 12 inch diameter well cover was installed over the 4 inch probe inlet port. The excavation was then backfilled with native soil to existing grade. Figure 8 shows the 10,000 gallon tank, the leachate transfer line and the concrete loading slab.

3.5 INSTALLATION OF AUTOMATIC VALVE

Figure 9 shows site layout and the location of the existing manual valve, and the location of

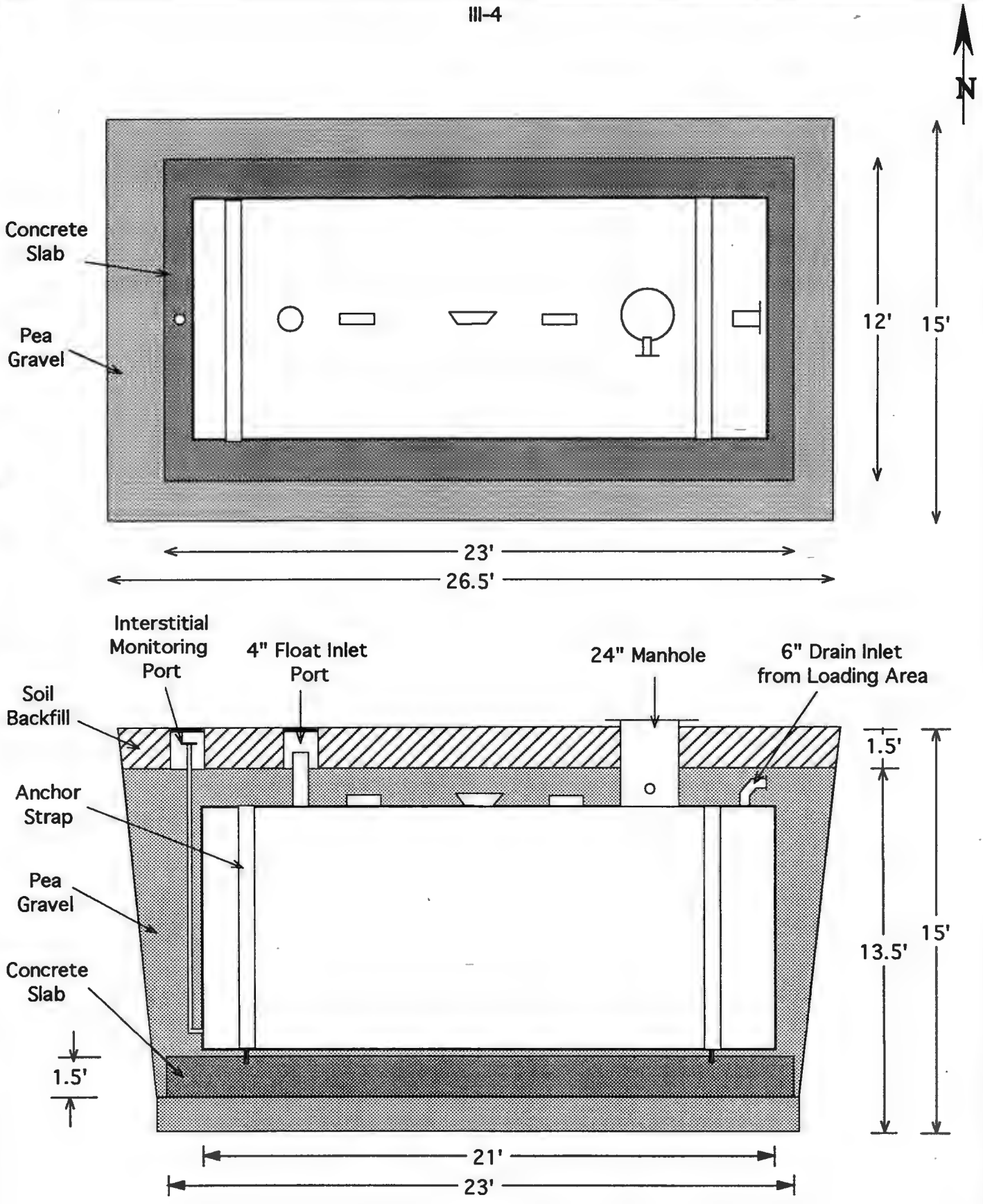


Figure 7. Plan and Elevation of Tank Excavation, Concrete Slab and Bedding

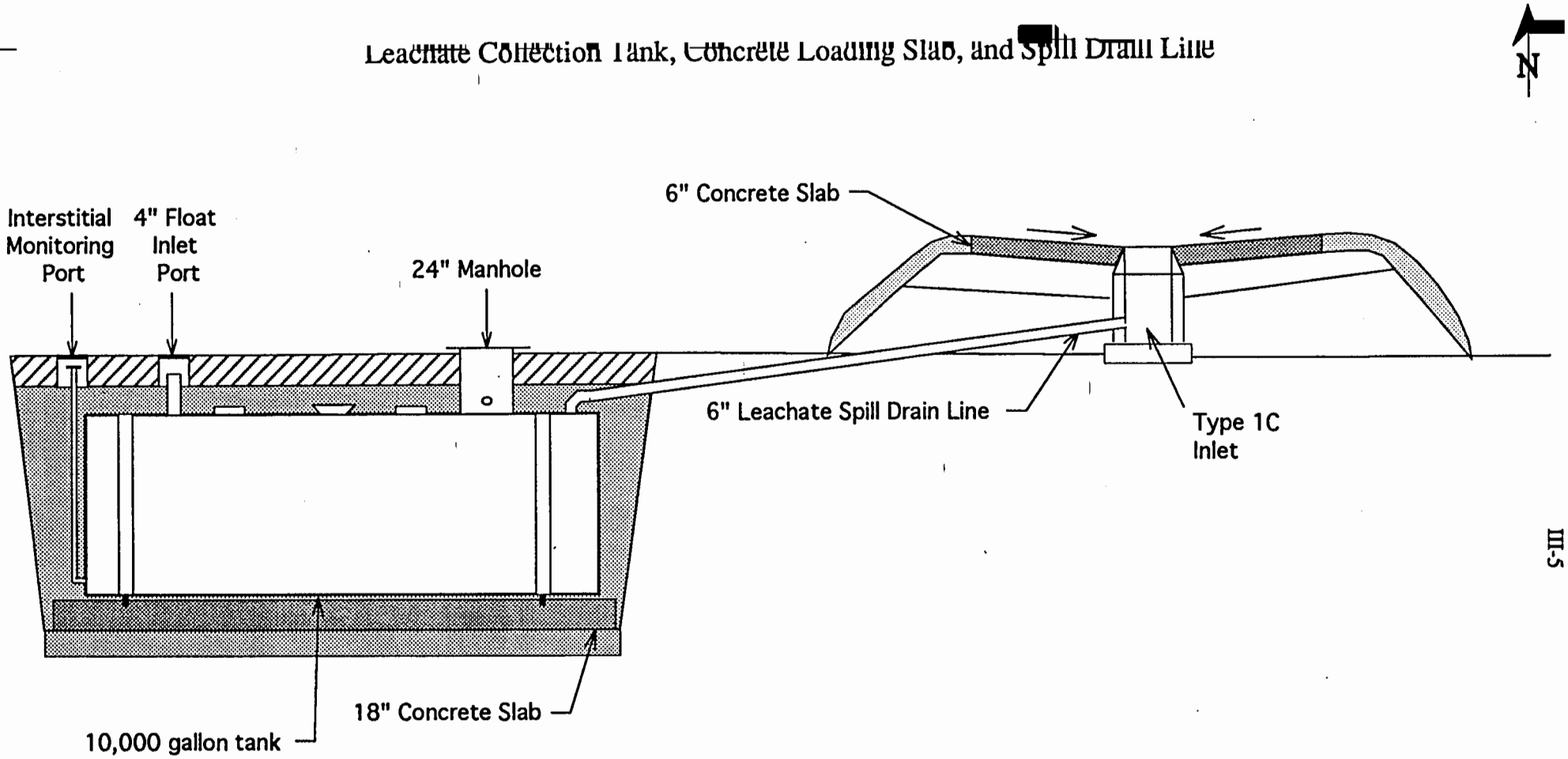
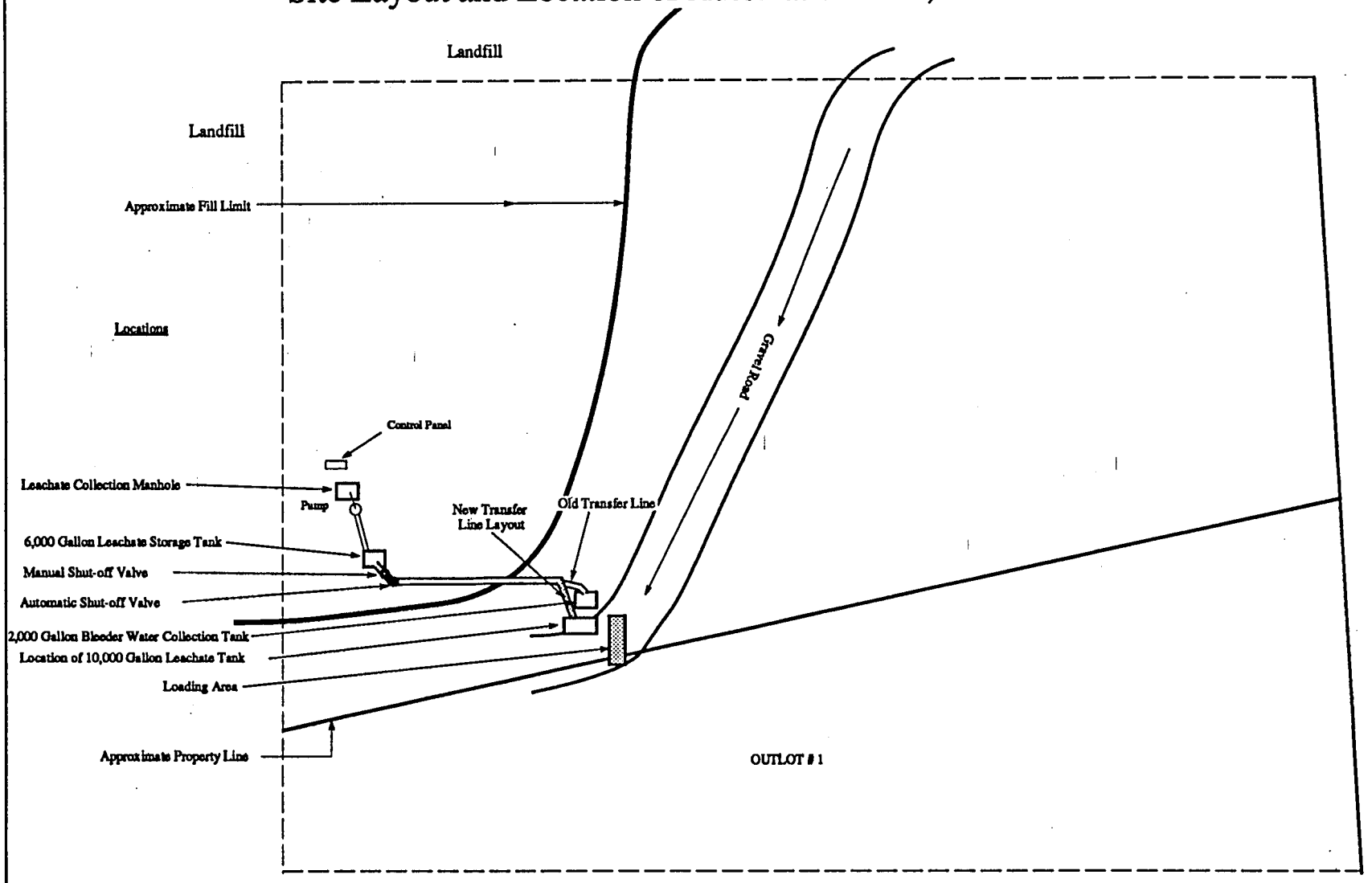


Figure 8. Leachate Collection Tank, Concrete Loading Slab, and Spill Drain Line

Site Layout and Location of Automatic Valve, and Transfer Line



Project Location	Engineer	Figure 9. Site Layout and Location of Automatic Valve, and Transfer Line				
Sanitary Transfer and Landfill Delafield, Wisconsin 53018	K. SINGH & ASSOCIATES, INC., Engineers & Environmental Management Consultants 1135 Legion Drive, Elm Grove, Wisconsin 53122, (414) 821-1171	DATE September 18, 1992	DRAWN BY R. B. S.	REVISIONS BY	DATE	PROJECT NO.
		SCALE 0' 50' 100'	CHECKED BY D. J. M.	R. B. S. R. N..	09/18/92 11/24/92	2096 SHEET NO. ONE

the automatic valve. The manual valve was shut off to prevent leachate spills from potential damage to the transfer line. The 4 inch diameter leachate transfer line was then exposed about 7 feet south of the manual valve. At this location the 4 inch diameter leachate transfer line was located approximately 6 feet below grade.

Approximately 5 feet of the transfer line was cut and removed. A manhole 5 feet in diameter at the base was then placed in this area. The automatic valve was then connected to the 4 inch line.

The elevations were also measured using the south-west corner of the slab as the reference marker at 100 feet elevation. The elevation to the leachate transfer line at the automatic valve was 107.31 feet, and the elevation to the top of the tank was 96.23 feet.

3.6 INSTALLATION OF TRANSFER LINE

As shown in Figure 9, the 4 inch transfer line feeding into the 2,000 gallon tank was rerouted to empty into the 10,000 gallon tank. As shown in the figure, the existing 4 inch line was cut at the north edge of the tank excavation. A trench, approximately 3 feet deep was then excavated between this point and the 4 inch leachate inlet port on the tank. The trench was then backfilled with a 6 inch layer of pea gravel. Four inch diameter, Schedule 80 pipe was then connected to the existing transfer line and led into the 10,000 gallon tank. Clay liner was not used since using clay liner in freezing conditions may cause damage to the transfer pipe. The trench was then backfilled with pea gravel to existing grade.

SECTION IV. LEACHATE MANAGEMENT

4.1 SYSTEM DESCRIPTION

Leachate is collected in the leachate collection manhole. A centrifugal pump then pumps the leachate into the 6,000 gallon leachate storage tank. The on/off function of the pump is controlled by two floats. The first set of float is placed in the leachate collection manhole. When the leachate level in the manhole increases beyond a certain point, the first set of float is activated and the pump is switched on. The pump stays on till the leachate level falls below this float.

The second set of float is placed in the 6,000 gallon leachate storage tank. When the leachate level increases beyond this float level, the pump is shut-off.

A manual and an automatic valve is in place in the 4 inch transfer line, between the 6,000 gallon leachate storage tank and the new 10,000 gallon leachate collection tank. Since the installation of the automatic valve the manual valve is kept open. The manual valve is to be used only in case of automatic valve failure. There are two floats placed in the 10,000 gallon tank, and one float in the 2,000 gallon tank. The difference in the height of the two floats in the 10,000 gallon tank is about 1-1/2 feet. The lower float when activated by rising leachate level in the tank will shut off the automatic valve and dial into one of 64 telephone numbers to inform about the condition. The system is finally shut down due to rising leachate level in the 6,000 gallon leachate storage tank.

The higher float in the 10,000 gallon tank is an added safety feature. If for any reason the automatic valve is not shut off completely, the leachate trickling into the tank will eventually activate this float. This float should not activate under normal operating conditions. Operator intervention is necessary to manually shut off the valve, when this float is activated.

A third float is placed in the 2,000 gallon tank. When this float is activated, the system will call in the assigned telephone number and inform about high liquid level in this tank. Arrangements to pump the contents of this tank should be made immediately.

4.1.1 AUTO ALARM FEATURES

The remote monitoring system consists of a DiaLog Plus system. This system monitors the leachate level in the 6,000 gallon, 10,000 gallon, and the 2,000 gallon tank. It also controls the automatic valve based on the leachate level in the 10,000 gallon tank.

The DiaLog Plus system uses a telephone line to call up the assigned telephone numbers, in case of alarm conditions. However, due to the distance between the control panel and the nearest available telephone pole, it was cost effective to use mobile phone network for communication between the system and the Engineer.

The DiaLog Plus is interfaced with a mobile phone line. The system is capable of calling up to 64 telephone numbers to inform about alarm conditions. There are three input channels in the control panel. A message for each of the channel alarm conditions has been recorded at the system. Table 5 lists the channel inputs and the messages that accompany each channel alarm

Table 5
Alarm Messages for Input Channels

Channel #	Function	Recorded Alarm Message
1	Controls Automatic Valve	The level in the 10,000 gallon is high, please arrange to pump from tank
2	High leachate level in 10,000 gallon tank	Leachate level in 10,000 gallon tank is too high, please respond at the site immediately
3	High water level in the 2,000 gallon tank	Level in the 2,000 gallon tank is high, please arrange to pump this tank

condition. The present system set-up is such that the unit will call in K. Singh and Associates office telephone number to convey alarm conditions.

The system status may also be obtained any time by calling (414) - 322 - 7450. The system parameters are set such that in the event of alarm condition in any of the three channels, the unit will call in, convey the alarm conditions and ask for acknowlegement. Entering *8 on the telephone will acknowledge the alarm condition. The system at present allows 6 hours to correct the alarm condition. If no action is taken to address the alarm condition, the system will call in again. If no acknowledgement is received the unit will call the assigned telephone numbers in sequence at 10 minute intervals. The instruction manual for DiaLog Plus system, the mobile phone line interface, and the automatic valve are included in Appendix E.

4.2 LEACHATE COLLECTION

The engineer will coordinate leachate hauling and disposal activities with the hauler. Activities will include weekly discussions to encourage hauling from the site every other day. A program for annual cleaning of the leachate collection system should also be coordinated. Leachate from the 10,000 gallon tank will be pumped as needed by a subcontractor. The automatic valve of the 6,000 gallon tank will be opened to allow leachate flow into the 10,000 gallon tank. From this tank the leachate will be pumped to a 6,000 gallon tanker. After the tanker is full, the automatic valve will be closed to prevent overflow of the 10,000 gallon tank. The leachate is presently disposed of to the City of Waukesha Wastewater Treatment Plant. Approximately, 6,000 gallons of leachate is currently pumped daily Monday through Friday. The leachate will not be pumped on weekends and holidays unless approved by the Department of Natural Resources Project Manager or under the emergency conditions if the WDNR Manager could not be reached.

4.3 MONITORING REQUIREMENTS

Monitoring results will be reported quarterly to the WDNR Project Manager. In addition to the quarterly reporting, a summary of leachate and gas system operations, including down time, problems, and proposed corrective actions will be submitted weekly.

A revised site survey map is under preparation. A copy of the revised site survey map will be sent to WDNR as soon as it is made available to K. Singh and Associates.

So West Bell

SECTION V. SITE MAINTENANCE

5.1 GENERAL

System maintenance consists of routine maintenance and repair maintenance.Routine maintenance requirements are expected to be minimal. With the exception of the blower, which requires monthly grease lubrication, most of the routine maintenance requirements are inspection tasks to monitor corrosion.

Repair maintenance includes items such as bearing replacements, seal replacements, etc. These maintenance items will normally be revealed during the routine inspections described above, or as a result of equipment failure. The specifications for the gas venting blower is included in Appendix F. The leachate pump and the manual valve are in operation for a number of years. The specifications for the pump and the manual valve are not available.

5.2 MAINTENANCE INSPECTION

An inspection of the site shall be conducted weekly, and should include the following areas:

1. The access road, drainage conveyances, spillways, and ditches shall be maintained. Erosion control structures shall be maintained where necessary.

2. The gas venting system, the leachate management system, the landfill cap, and the access road should be inspected on a weekly basis.

5.2.1 MOWING

The grass on the landfill cover should be mowed at least on an annual basis. The frequency of mowing may be increased depending on the growth of vegetation and approval by the WDNR Project Manager.

5.2.2 PLOWING

The access road should be kept plowed at all times during the winter months for leachate collection. Due to the grade of the access road, washouts become a problem in the summer months. Regular inspections should be made to determine the need for gravel filling and grading to keep the road accessible.

5.2.3 LEACHATE COLLECTION SYSTEM

During routine leachate collection, the leachate manhole, valves and tank system should be inspected for signs of leakage and system failure. Pumps should be inspected on a weekly basis for abnormal noise or vibration.

5.3 REPORTING REQUIREMENTS

An annual report will be submitted to the Department. The annual report will document the performance of the leachate collection and gas venting systems as well as document repairs and replacements made to the systems. The report will include the items addressed in Section II.

SECTION VI. SITE SPECIFIC SAFETY CONSIDERATIONS

6.1 GENERAL

The employees who will be involved in the post-closure monitoring of the landfill will be trained in the following procedures:

1) Proper material handling;

2) Proper methods for the use, storage and disposal of decontamination fluids;

3) Preventive maintenance of supporting equipment;

3) Requirements and use of respirators; and

4) Appropriate response to personal contamination or emergency conditions.

All involved members of the monitoring team will be instructed in the use of methods for keeping safe areas free from contamination and the administration of proper first aid. Employees will be educated in reacting to emergency fire, explosion, and other site-specific hazards. To promote quick response without confusion in the case of emergencies, employees will be informed as to how to report any emergencies.

This section includes pertinent site specific information relative to the hazard evaluation mechanism for upgrading protection levels and the basis for making informed decisions consistent with the new Hazardous Waste Operations and Emergency Response Interim Rule (29 CFR 1910.120) prior to the initiation of the site work.

6.2 SITE CHARACTERISTICS

The site is a sanitary transfer and landfill facility. Any staff, including the sub-contractors, will not be required to enter a confined space in order to perform the specified tasks.

The topography of the site indicates that the center of the landfill is at an elevation of about 1070 feet MSL. The elevation around the perimeter of the landfill varies from 1010 to 1050 feet MSL.

This indicates that surface water will flow in all directions from the center of the site. Groundwater at the site flows in mainly in northeast, southwest, and southeasterly directions.

To the southeast and southwest of the site are private residential areas, which contain many monitoring wells. Located to the north is Interstate 94, and to the northwest across I-94 are more residences, and monitoring wells. There are several homes located on the southwest perimeter of the landfill site. Ormson Corporation, an industrial building, is located east of the landfill. Nichols buildings are located at the northeast corner of the landfill.

6.3 SITE SPECIFIC SAFETY PLAN

The Site Safety Plan addresses an approach to managing site hazards, methane gas monitoring systems, site control, site work procedures, personal protective equipment, decontamination and site emergency procedures.

At sanitary landfill sites, the hazards are associated with concentrations of methane, and leachate, in the soil, and on the groundssurface. A methane meter will be used to monitor quality of air at the project site. Because the atmosphere inside the leachate manhole is a confined space, special protection need to be required.

Level D protection will be required for the staff actively involved in the implementation of the field work. In addition, an explosiometer and oxygen level indicator are included during the site investigation phase.

Level D protection is primarily a work uniform. Level D personal protective equipment will include coveralls, safety boots / shoes, chemical resistant steel toe and shank, safety glasses or chemical splash goggles, hard hat, and gloves. The optional requirements may be escape mask and face shield

The field investigation team will be required to take protection at Level D. High levels of protection may be required if data gathered during field investigation indicate high concentrations of methane gas.

6.4 EMERGENCY RESPONSE

Immediate action must be taken by the first person to recognize any emergency event. First aid equipment should be always kept in the vehicle. However, some information required to meet any emergency situation are given below:

Emergency Telephone Numbers

Immediate Emergencies:

Fire: 367-2600 Ambulance: 367-2600
Local Police: 367-2600 State Police: 1-800-321-4400
Medical Emergencies: 367-2600

Nearest Hospital: - Waukesha Memorial
Hospital Telephone: 544-2011
Directions to Hospital: Take I-94 East to HWY 164 get off on 164 turn right. At the 3rd set of stop & go lights turn right on Madison. Go up a steep hill and take left on 3rd, 4th, or 5th street. They will take you to the hospital. (Follow the blue signs).

When transporting an injured person to a hospital, bring this site safety plan to assist medical personnel with diagnosis and treatment. Four different routes of exposure and their respective first aid/poison management procedures are outlined below:

Ingestion:

DO NOT INDUCE VOMITING. Transport person to nearest hospital immediately.

Inhalation/Confined Space:

DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED AND A STAND-BY-PERSON IS PRESENT.

Inhalation/Other:

MOVE THE PERSON FROM THE CONTAMINATED ENVIRONMENT. Initiate CPR if necessary. Call or have someone call for medical assistance. If necessary, transport the victim to the nearest hospital as soon as possible.

Skin Contact/Liquid Chemical:

IMMEDIATELY FLUSH SKIN WITH A LARGE AMOUNT OF WATER. The monitoring team should always contain sufficient amount of water in the vehicle. However, water may be obtained from the office of the Ormson Corporation located east to the landfill. Remove any contaminated clothing and reflush skin. If the chemical was a non-caustic chemical, such as gasoline, use soap, if available. If the chemical was a powder, first brush it off with a clean cloth, then rinse with water. Transport person to a medical facility if necessary.

Eyes:

HOLD EYELIDS OPEN AND FLUSH THE EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER. If possible, have the person remove his/her contact lenses (if worn). Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible. Fifteen minutes of rinsing is recommended with a suitable source of water; i.e., 5 gallon jug of water, portable eye washes, or permanently installed eye washes.

<u>Other Telephone Numbers</u>

Poison Control Center: 1-266-2222

Environmental Emergency:

Regional EPA Office: 312-353-2000
National Response Center: 1-800-424-8802
U.S. EPA (24-hour hotline): 1-800-424-9346

State Regulatory Agency:

Mr. Roger Klett, Project Manager	Number: (414) 961-2707
WDNR, Milwaukee Office	Number: (414) 961-2727

6.5 HAZARDOUS SITUATIONS

Personnel encountering a hazardous situation shall instruct others on site to EVACUATE THE VICINITY IMMEDIATELY and call the Project Manager.

The site must not be re-entered until back-up help, monitoring equipment, and personal protective equipment are on hand.

6.6 USUAL PROCEDURES FOR INJURIES

1. Telephone for ambulance / medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of the physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital.

2. Send / take this Site Safety Plan (SSP) to medical facility with the injured person.

3. If the injury is minor, administer first aid.

4. Notify the Project Manager about all accidents, incidents and near miss situations.

SECTION VII. CONCLUSIONS

This manual has been prepared to describe post closure monitoring and maintenance activities for the Sanitary Transfer and Landfill of Delafield as required by the Wisconsin Department of Natural Resources. These activities include on-site groundwater monitoring, off-site monitoring of private wells, methane gas monitoring, leachate collection and pumping, and maintenance of the leachate and gas ventilation systems, as well as the landfill cover and access road.

A 10,000 gallon leachate collection tank and concrete loading area have been installed. An automatic valve controls the leachate flow from the 6,000 gallon leachate storage tank to the 10,000 gallon leachate collection tank. Leachate is pumped on the average five days a week. In wet weather during spring and early fall, the frequency of leachate pumping may need to be increased. The new tank is equipped with a DiaLog Plus remote monitoring system. This system also controls the automatic valve function, depending on the leachate level in the 10,000 gallon tank.

SECTION VIII. REFERENCES

1. Technical Specifications for Installing Leachate Collection System, Prepared by K. Singh & Associates, Inc. Submitted to WDNR on October 1992.

2. Installation of Underground Petroleum Storage Tanks, American Petroleum Institute, Fourth Edition, November 1987.

APPENDIX A

Figure 2. Location of On-site and Off-site Monitoring Wells
Figure 3. Site Survey Map

APPENDIX B

Concrete Compression Test Results

Testing and Inspection of:
Soils
Concrete
Asphalt

Wisconsin
TESTING LABORATORIES
N59 W14176 Kaul Avenue
Menomonee Falls, Wisconsin 53051
414-252-3300

Foundations
Borings
Corings
Reports

RECEIVED
J.H. HASSINGER, INC.

#941

COMPRESSION TEST REPORT

Job No. C-92101

Report No. 2 — 21 Day Test — Date 12/22/92
3 — 28 Day Test — 12/29/92
..... — ..... Day Test — .....

Date Molded 12/1/92 ..... Received 12/2/92

Project ..... Delafield DNR Landfill

Contractor ..... J.H. Hassinger, Inc.

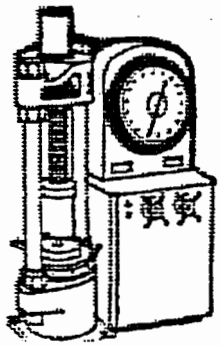
Location of Pour ..... Upper Slab

Cubic Yards Poured ..... 17 Yds.

Reported to ..... J.H. Hassinger, Inc. (2)

Laboratory Number	10589	10590	10591	10592
Job Cyl. Number	1	2	3	4
Date Tested	12/22	12/22	12/29	12/29
Age, Days	21	21	28	28
Truck Ticket Number	804647	804647	804647	804647
Area, Sq. In.	28.27	28.27	28.27	28.27
Dimension, Inches	6x12	6x12	6x12	6x12
Weight per cu. ft., lbs.				
Total Loads, lbs.	178,000	170,000	192,000	191,000
Unit Load, P.S.I.	6,300	6,010	6,790	6,760

Mix: Medusa, 6½ Bag
Cement
Sand
No. 1
No. 2
Water
Remarks:



Slump ..... 4"
Admixture ..... Not Reported
Ready Mix Plant ..... Tews
Cyls. Made by ..... Fred
Weather ..... Cloudy, 27°
Average at 21 Days 6,160 P.S.I.
Average at 28 Days 6,780 P.S.I.
..... Days ..... P.S.I.
Spec. Req. at 28 Days 4,000 P.S.I.

Respectfully Submitted,

WISCONSIN TESTING LABORATORIES

.....

Testing and Inspection of:
Soils
Concrete
Asphalt

Wisconsin
TESTING LABORATORIES
N59 W14176 Kaul Avenue
Menomonee Falls, Wisconsin 53051
414-252-3300

Foundations
Borings
Coring
Reports

COMPRESSION TEST REPORT

Job No. C-92101

Report No. 2 21 Day Test Date 12/22/92
..... Day Test .....
..... Day Test .....

Date Molded 12/1/92 Received 12/2/92

Project Delafield DNR Landfill

Contractor J.H. Hassinger, Inc.

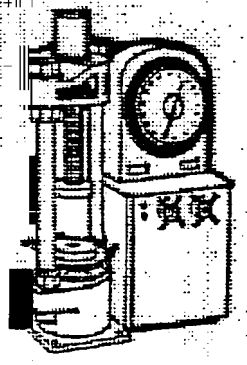
Location of Pour Upper Slab

Cubic Yards Poured 17 Yds.

Reported to J.H. Hassinger, Inc. (2)

Laboratory Number	10589	10590
Job Cyl. Number	1	2
Date Tested	12/22	12/22
Age, Days	21	21
Truck Ticket Number	804647	804647
Area, Sq. In.	28.27	28.27
Dimension, Inches	6x12	6x12
Weight per cu. ft., lbs.		
Total Loads, lbs.	178,000	170,000
Unit Load, P.S.I.	6,300	6,010

Mix: Medusa, 6¼ Bag
Cement
Sand
No. 1
No. 2
Water
Remarks:



Slump 4"
Admixture Not Reported
Ready Mix Plant Tews
Cyls. Made by Fred
Weather Cloudy, 27°
Average at 21 Days 6,160 P.S.I.
Average at ..... Days ..... P.S.I.
..... Days ..... P.S.I.
Spec. Req. at 28 Days 4,000 P.S.I.

Respectfully Submitted,

WISCONSIN TESTING LABORATORIES

By .....

Testing and Inspection of
Soils
Concrete
Asphalt

Wisconsin
TESTING LABORATORIES
N59 W14176 Kaul Avenue
Menomonee Falls, Wisconsin 53051
414-252-3300

Foundations
Borings
Corings
Reports

RECEIVED
DEC
J.H. HASSINGER, I

COMPRESSION TEST REPORT

Job No. C-92101

Report No. 1 21 Day Test Date 12/21/92
....Day Test .....
....Day Test .....

Date Molded 11/30/92 Received 12/2/92

Project Delafield DNR Landfill

Contractor J.H. Hassinger, Inc.

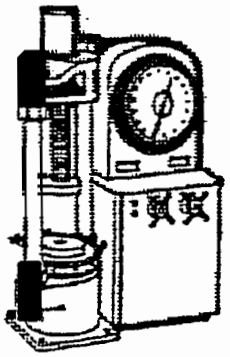
Location of Pour Lower Tank Slab

Cubic Yards Poured 16½ Yds.

Reported to J.H. Hassinger, Inc. (2)

Laboratory Number	10585	10586	10587	10588
Job Cyl. Number	1	2	3	4
Date Tested	12/21	12/21	12/21	12/21
Age, Days	21	21	21	21
Truck Ticket Number	804359	804359	804359	804359
Area, Sq. In.	28.27	28.27	28.27	28.27
Dimension, Inches	6x12	6x12	6x12	6x12
Weight per cu. ft., lbs.				
Total Loads, lbs.	195,000	176,500	182,500	204,500
Unit Load, P.S.I.	6,900	6,240	6,460	7,230

Mix: Medusa, 6¼ Bag
Cement
Sand
No. 1
No. 2
Water
Remarks:



Slump 4"
Admixture Not Reported
Ready Mix Plant Tews
Cyls. Made by Jim Thomson
Weather Cloudy, 32°

..... Days. ..... P.S.I.
Average at 21 Days. 6,710 P.S.I.
..... Days. ..... P.S.I
Spec. Req. at 28 Days. 4,000 P.S.I.

Respectfully Submitted,

WISCONSIN TESTING LABORATORIES

.....

APPENDIX C

Photographs Taken During Construction Activity

Construction of the Concrete Slab

View of the Finished Concrete Slab

Unloading the Tank From the Trailer

Air Testing of the Tank in Progress

A View of the Trench for Electrical Conduits

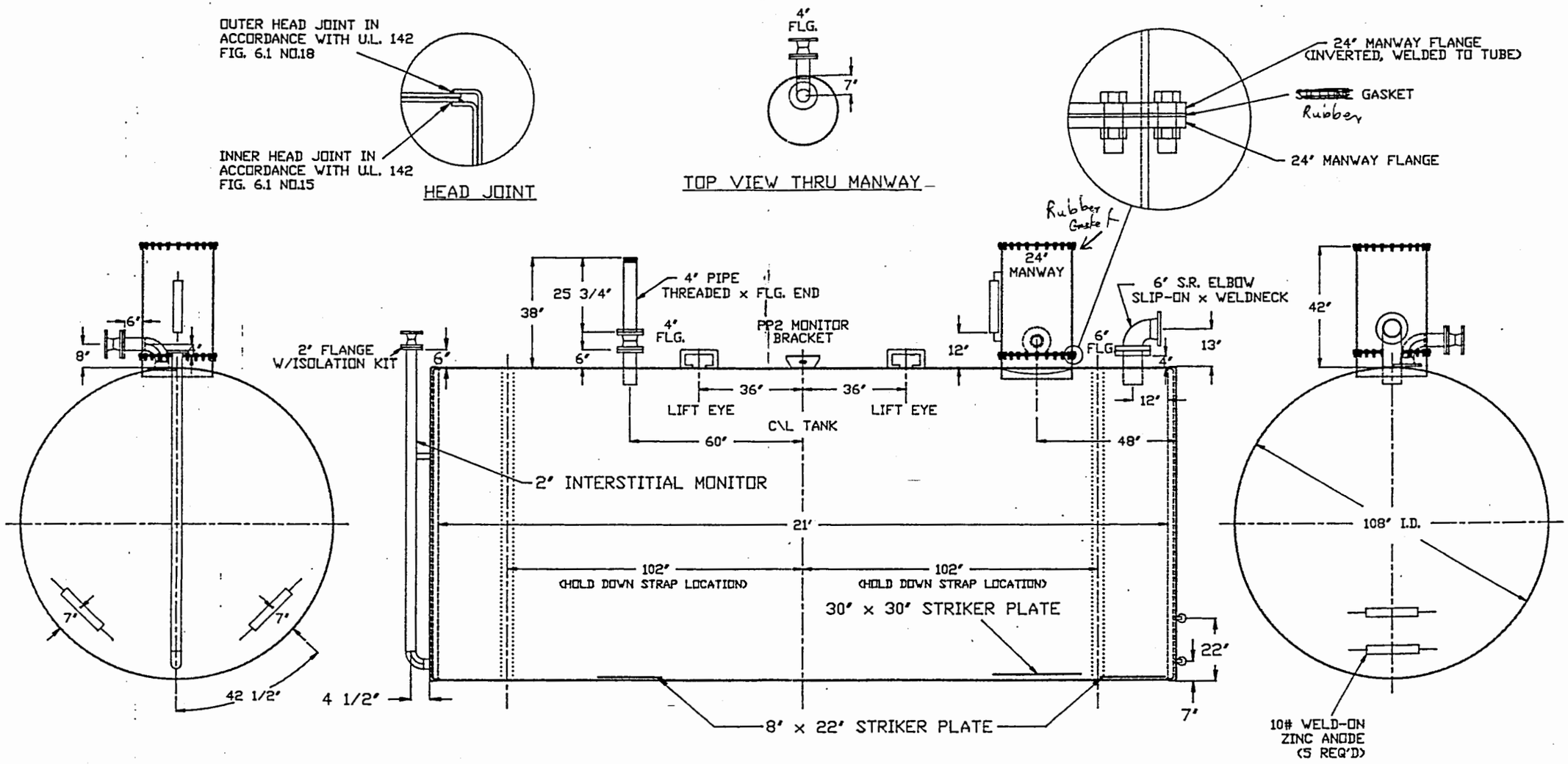
Laying the Conduit in the Trench

Placing the Tank in the Excavation

Checking the Level of the Tank, Prior to Anchoring

APPENDIX D

Technical Drawing of the 10,000 gallon Leachate Collection Tank



MATERIAL:

1/4" INNER TANK
3/16" OUTER SHELL (NOT 7 GAUGE)
1/4" OUTER HEADS
1/4" STRIKER PLATES
ALL FLANGES INCLUDE ISOLATION KITS

NOTE:

1) APPLY 15 MILS DRY (HEAD) & 10 MILS DRY (SHELL) OF CORROCOTE II (OUTSIDE).
2) HAVE PROTECTION PROVER 2 FOR ANODE TESTING.
3) BUILT & TESTED TO U.L. & STI STANDARDS.
4) APPLY 2 COATS, 16 TOTAL MILS MIN. OF KOPPERS 300 M INSIDE.

REV. NO.	REVISION	BY CHK'D	DATE
2	ADDED 4" FLG. W/PIPE	JH	11/25/92
3	CHANGED INTERIOR PAINT	JH	12/2/92
4	MOVE 6" FLG., GENERAL REVISIONS	JH	12/4/92

DESIGNED BY: DATE:
DRAWN BY: JH DATE: 11/20/92
CHECKED BY: DATE: 92
SCALE:

USEMCO
USEMCO INCORPORATED
P.O. BOX 583 (608) 372-5911 TOMAH WI. 54660

DESCRIPTION
STI-P3 10,000 GALLON
TYPE 1 DOUBLE WALL TANK

DWG. NO. AT3\10010841
JOB NO. 93364

Tank Institute
R821-91

UNDERGROUND STEEL STORAGE TANKS
WITH sti-P3® CORROSION CONTROL SYSTEM

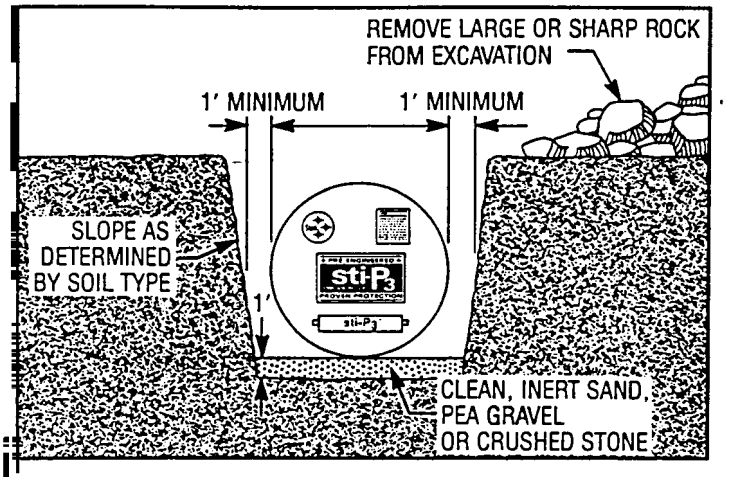
PRE-ENGINEERED sti-P3® PROVEN PROTECTION

INSTALLATION INSTRUCTIONS

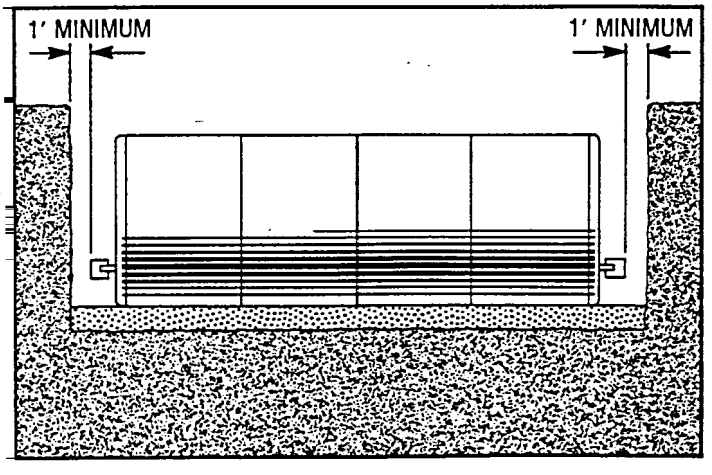
1. Excavation and Bedding

1.1 The excavation shall be free from any hard or sharp material that may cause damage to the tank coating. (Care shall be taken during installation that foreign matter is not introduced into the excavation or backfill.)

1.2 Bedding and backfill shall be homogenous material consisting of clean sand, pea gravel, No. 8 crushed stone (ASTM 448) or equivalent.

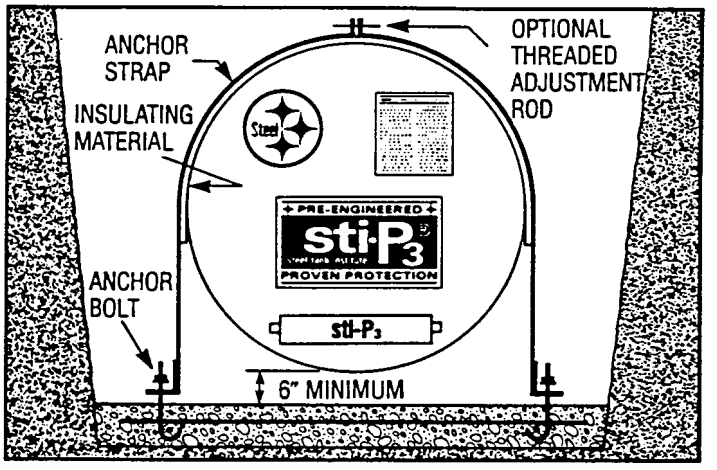


1.3 The bottom of the excavation shall be covered with bedding material to a depth of one foot, suitably graded and leveled, and extend at least 1 foot around the perimeter of the tank and anodes for backfill operations.



1.4 Where anchoring by means of a concrete slab is required, the tank must *not* be placed directly on the pad. A layer of bedding material at least 6 inches deep must be spread evenly over the dimensions of the pad to separate the tank from the pad.

The tank shall not be placed on any other hard or sharp material that can cause deformation of the tank or damage to the coating.

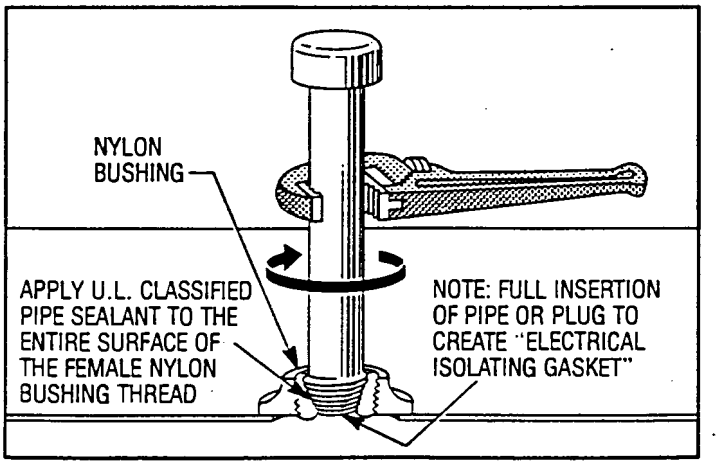


1.5 In a tidal area, backfill or bedding material composed of small particles, such as sand, can migrate into native soils, where larger aggregate, such as pea gravel or crushed stone, exists. Resultant voids can create an uneven support for the tank. Use of filter fabric should be considered.

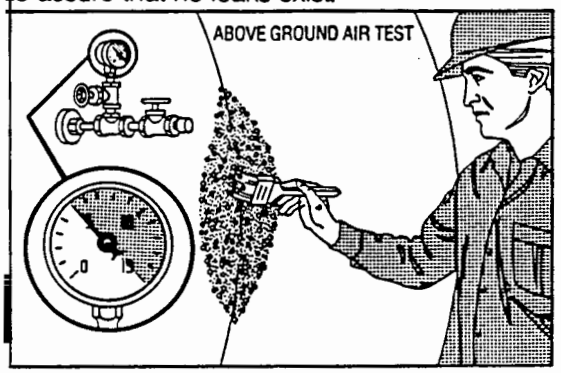
2.0 Above Ground Air Test

2.1 The temporary plugs and thread protectors installed by the manufacturer shall be removed. Apply compatible, non-hardening pipe sealant to internal bushing threads. Permanent metal plugs shall be installed at all unused openings.

2.2 The dielectric bushings in sti-P3® tanks shall not be removed from the unused openings. Plugs used to temporarily seal the tank for the above ground air test but later removed for pipe installation shall not be over-tightened. Care shall be taken not to crossthread or damage the nonmetallic bushings when replacing plugs or installing required tank piping.



An air test of the tank above ground is required. Pressure should not exceed 5 pounds per-square-inch (PSIG) while a soap solution is applied to weld seams and fittings to assure that no leaks exist.

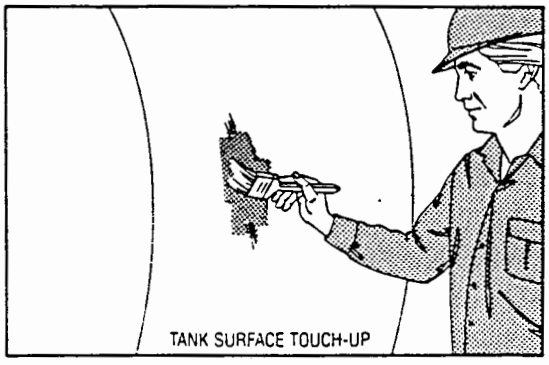


Dual wall tanks will require different air pressure testing procedures. Do not connect a high pressure air line directly to the interstitial monitoring port. Vacuum testing of the interstitial space of a dual wall tank can be used in lieu of or in addition to the air test procedure. Consult tank fabricator for air test recommendations. Do not apply a vacuum to the primary tank or a single wall tank. PEI/RP 100-90 also provides guidelines.

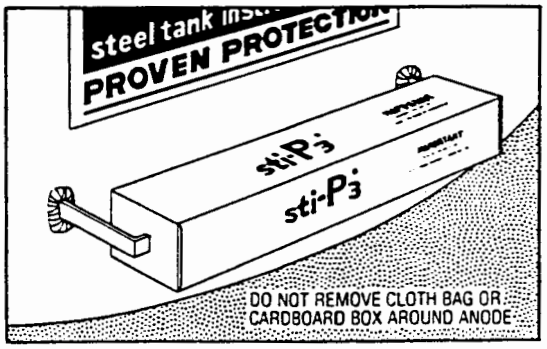
Take necessary safety precautions during air tests. Do not leave tanks unattended.

Before placing the tank in the excavation, all dirt clods and similar foreign matter shall be cleaned from the tank, and areas of coating damage shall be repaired with a touch-up coating provided.

Clean damaged coating areas through removal of surface rust, dirt, contaminants and disbonded coating prior to application of touch-up coating (See SSPC SP-2 "Hand Tool Cleaning" or SP-3 "Power Tool Cleaning" for additional guidance).



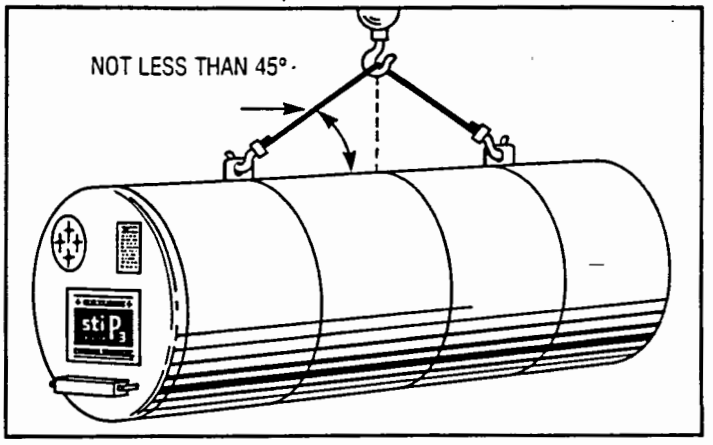
When so shipped, remove protective plastic covering from weld-on zinc anodes to assure proper anode operation. Verify integrity of anode connection prior to backfill.



5.0 Tank Handling

5.1 Equipment to lift the tank shall be of adequate size to lift and lower the tank without dragging and dropping to ensure no damage to the tank or the coating.

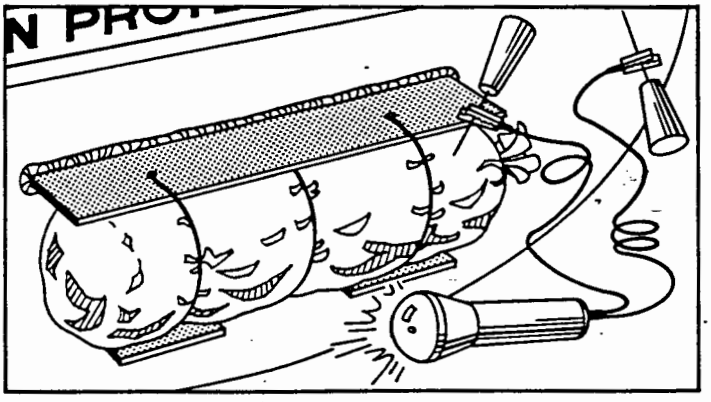
5.2 Tanks shall be carefully lifted and lowered by use of cables or chains of adequate length attached to the lifting lugs provided. A spreader bar should be used where necessary. *Under no circumstances use chains or slings around the tank shell.*



6.0 Anode Integrity

6.1 sti-P_3® tanks may be equipped with either zinc or magnesium anodes. Whereas magnesium anodes are designed only for installation in soil resistivities of 2000 ohms-cm or greater, zinc anodes are effective in all soil resistivities.

6.2 After an sti-P_3® tank has been placed in the excavation, if anode is connected by a lead wire, attachment to the tank shall be checked to assure this connection has not been damaged. Where damaged, the connection must be reestablished in strict accordance with sti-P_3® specifications.

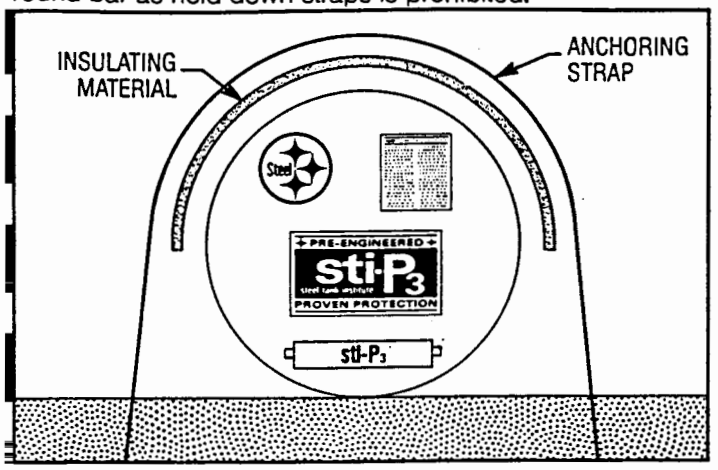


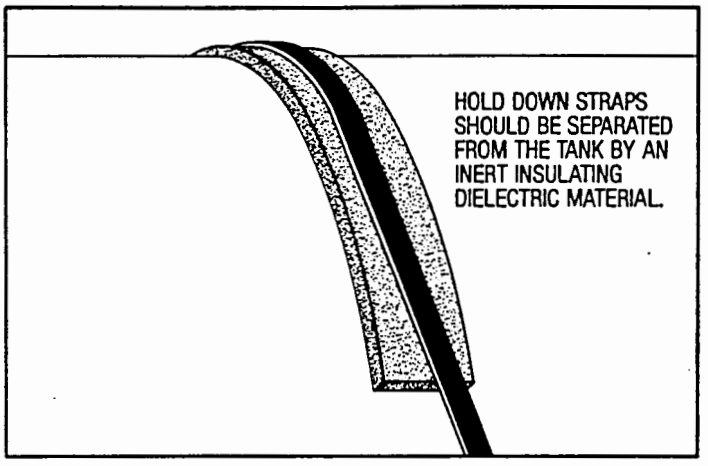
6.3 To assure immediate operation of cathodic protection system, each anode shall be thoroughly saturated with water at time of backfill operation.

7.0 Anchoring

7.1 High water tables or partially flooded excavation sites exert significant buoyant forces on tanks. Buoyant forces are partially resisted by the weight of the tank, the backfill and the pavement atop the tank. Additional buoyant restraint when required is obtained by using properly designed hold down straps in conjunction with concrete hold down slabs or deadman anchors. The use of steel cable and round bar as hold down straps is prohibited.

7. Special care should be exercised when installing hold down straps to ensure that the straps are separated from the tank by a separating pad made of inert insulating dielectric material. The separating pad should be wider than where the hold down straps would come into direct contact with the tank shell. The use of steel cable and round bar as hold down straps is prohibited.

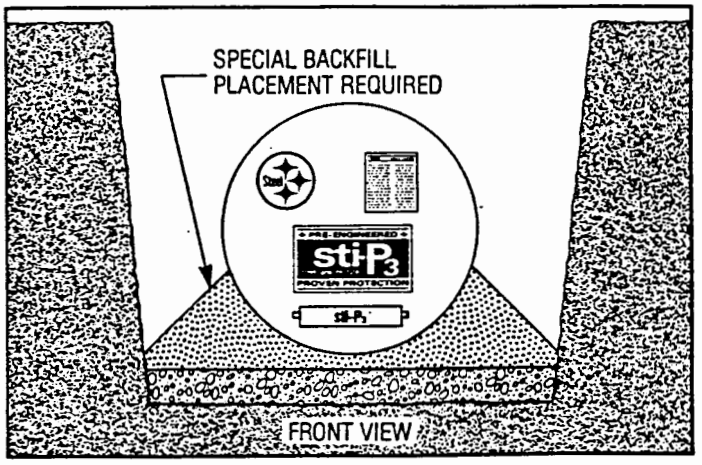


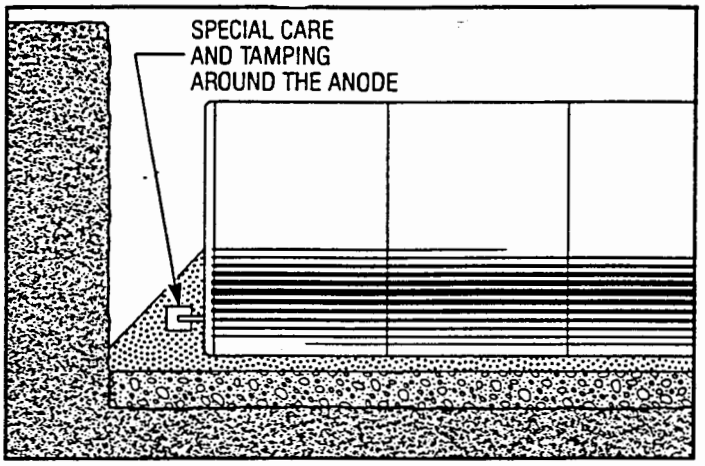


8.0 Backfilling

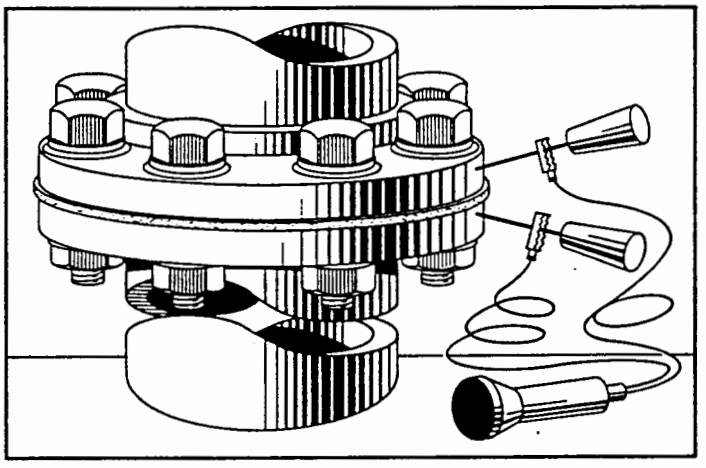
8.1 Homogeneous backfill, similar to bedding material, shall be placed around the entire tank to create a uniform homogeneous environment.

8.2 Special care shall be taken when installing backfill along the bottom sides of the tank to ensure that the tank is fully and evenly supported around the bottom quadrant.





8.3 Prior to backfilling top of tank, all openings shall be visually inspected to assure that the sti-P_3® dielectric nylon bushings remain in place. Where flanged openings have been used, the dielectric isolation shall be confirmed with a continuity tester. No current shall pass through the factory installed dielectric flanges. Dielectric isolation is required to assure tank integrity.



9.0 Final Air Test

9.1 Install required tank piping using compatible non-hardening sealant, taking care not to crossthread or damage the nonmetallic bushings. Torque of 400 to 1,000 ft-lbs may be required to fully insert pipe.

9.2 Where air or hydrostatic testing is required after installation, the pressure applied shall not be in excess of 5 pounds per-square-inch (PSIG) as measured at the top of the tank.

10.0 Tank Monitoring System Installation

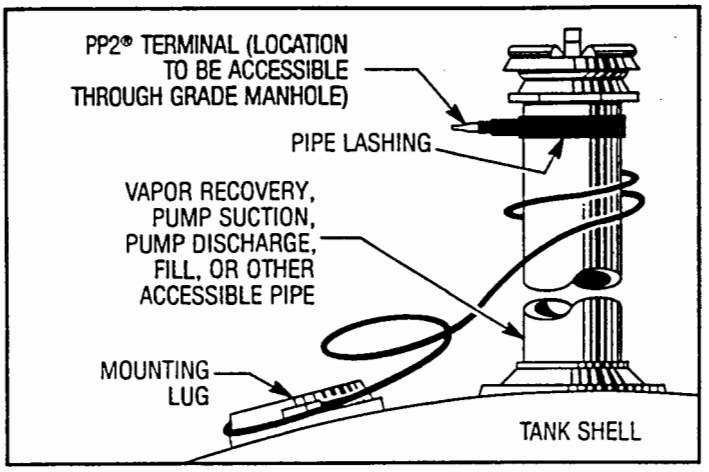
10.1 Each tank shall have a cathodic protection monitoring station (PP2®, PP1 or other) installed in such a way so that there will be at least a tank structure lead easily accessible and identifiable at the finish grade and provide easy placement of a reference electrode during monitoring.

10.2 If your tank is equipped with a Protection Prover 2®, prior to completion of the backfill, the monitoring terminal located near the top of the tank must be positioned as follows:

10.3 Select a terminal location on a pipe near grade that will be accessible through a grade manhole upon completion of installation.

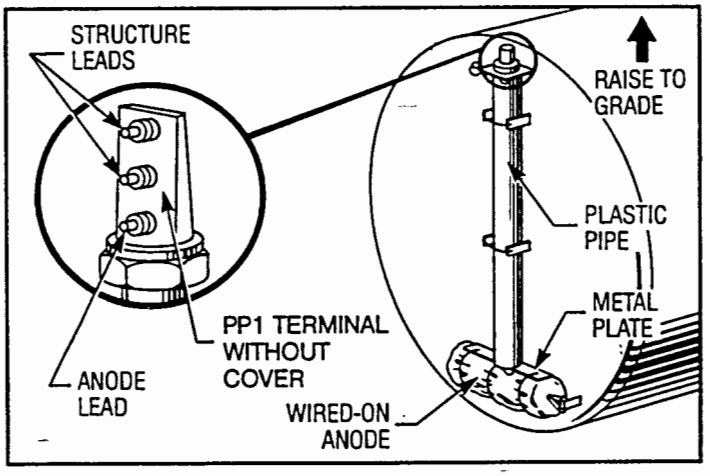
10.4 Loosen the black nylon pipe lashing by releasing the locking tab. Uncoil enough lead wire from the tank mounting lug to reach the terminal location with an additional 4 feet of slack.

10.5 Secure the PP2® terminal to the pipe by tightening the black nylon pipe lashing. The lead wire terminations shall remain sealed.



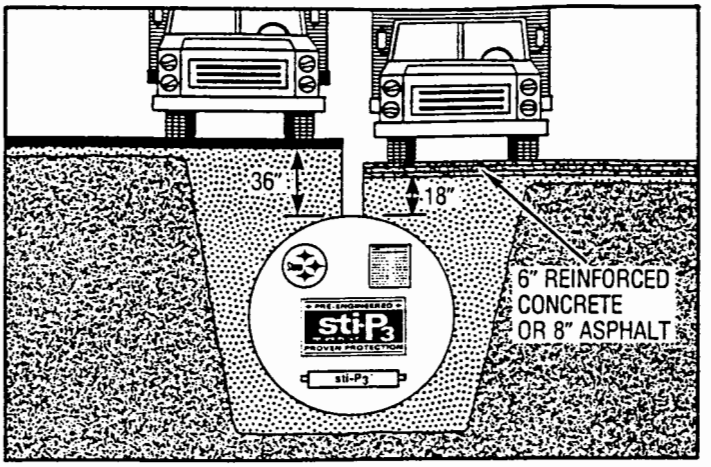
10.6 Route wire to avoid strain or breakage during backfill. Do not cover PP2® terminal with backfill material.

10.7 If the tank is equipped with a Protection Prover 1 monitoring system, which includes a monitoring test station mounted at the end of the tank, prior to any backfilling, extend the monitoring system to 4" below grade level without pulling it out of the mounting bracket. The PP1 test station shall be protected by a grade manhole of 7½" minimum diameter.

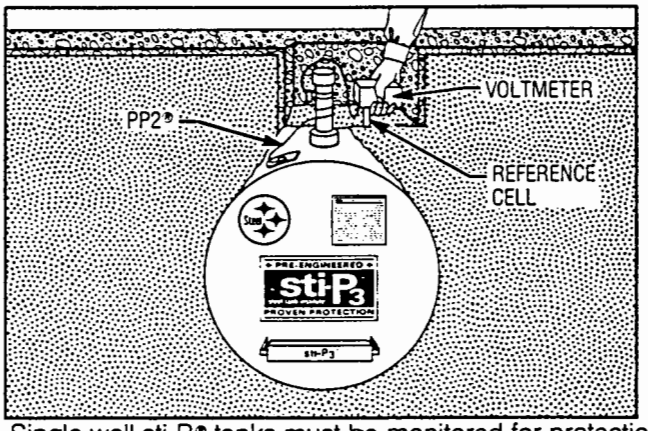


11.0 Contact between the steel tank and all other structures, such as external and internal piping, pumps, valves, gauge and monitoring equipment, and grounding systems will nullify the cathodic protection design. Prior to backfill, a simple continuity test between the tank lead wire and each connected system will verify the electrical isolation. Continuity shall not be present. After backfill, continuity can be checked with a high impedance voltmeter by fixing a copper/copper sulfate reference cell in the soil and contacting all structures with the other voltmeter lead wire. Do not move the reference cell. Potential differences between the tank to soil and all other structures to soil must exceed 3 millivolts to verify electrical isolation.

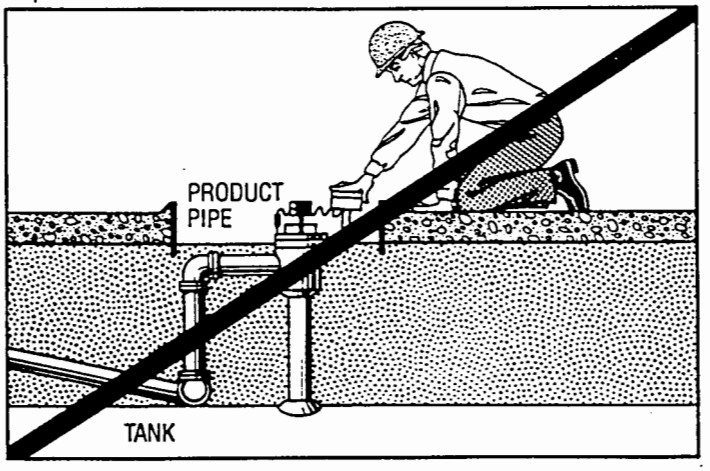
12.0 Homogeneous backfill shall be deposited carefully around tank and to a depth of at least one foot over tank to avoid damage to coating especially where tamping is required. (See NFPA 30 and state or local codes for a minimum depth of cover required.)



13.0 All tanks must be monitored to assure proper installation and ensuing cathodic protection of the tank. Before pouring concrete or asphalt pad atop tank, a tank to soil potential reading with a high impedance voltmeter and copper/copper sulfate reference electrode must be taken. Reference electrode shall be placed in moist soil directly above the tank. A reading of −850 millivolts or more negative must be obtained to indicate that the tank is protected from corrosion. Record reading on Warranty Validation Card, Installer Information Card and other permanent files. Return Installer Information Card to Steel Tank Institute.



14.0 Single wall sti-P_3® tanks must be monitored for protection within 6 months of installation and every 3 years thereafter. sti-P_3® tanks with FRP laminate which meets STI's ACT-100® specification, do not require monitoring. Follow applicable local, state and federal regulations for additional requirements. Reference NACE RP-02-85 for more specifics on protection criteria.



(NOTE: Grounded sti-P_3® tanks will impact cathodic protection effectiveness and monitoring readings.)

APPENDIX E

Instruction Manual for DiaLog Plus System, and Specification for Automatic Valve

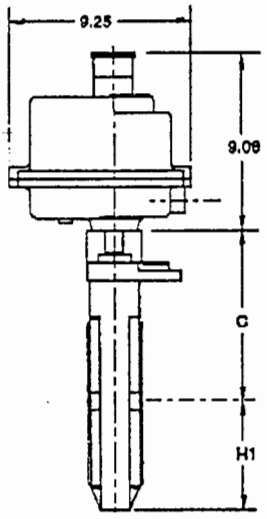
SERIES 92 ELECTRIC ACTUATOR

INTRODUCTION

For over 15 years Asahi/America has been at the forefront of thermoplastic valve technology. Today the Asahi/America line is the broadest in the industry in terms of size, range, valve types, materials, features and options. Asahi/America is now proud to introduce its own line of corrosion resistant electric actuators.

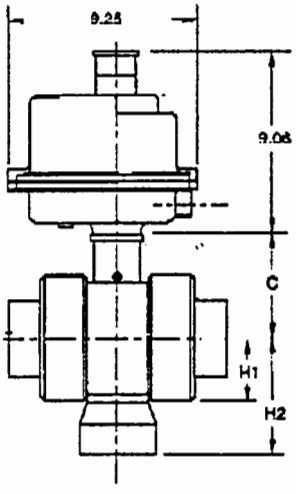
FEATURES

- Reversing type motor, 115V/60 Hz
- Brushless, capacitor run motors (AC models)
- Permanently lubricated gear train
- Thermally-bonded epoxy powder coating
- Declutchable manual override
- Visual position indicator (beacon); valve position visible from a distance
- Combination Nema IV and VII enclosure
- Duty cycle 25% at 10 seconds
- Auxiliary contacts for light indication
- ISO bolt circle
- Mechanical brake: 5" butterfly valve and larger sizes



BUTTERFLY VALVES

Sz. (in.)	C (in.)
1	6.06
1½	6.06
2	6.06
2½	6.06
3	6.06
4	6.06
5	6.06
6	6.06
8	6.06
10	6.06
12	6.06



BALL VALVES

Sz. (in.)	C (in.)
1	6.06
1½	6.06
1½	6.06
2	6.06
2½	6.06
3	6.06
4	6.06
6	6.06
8	6.06
10	6.06
12	6.06

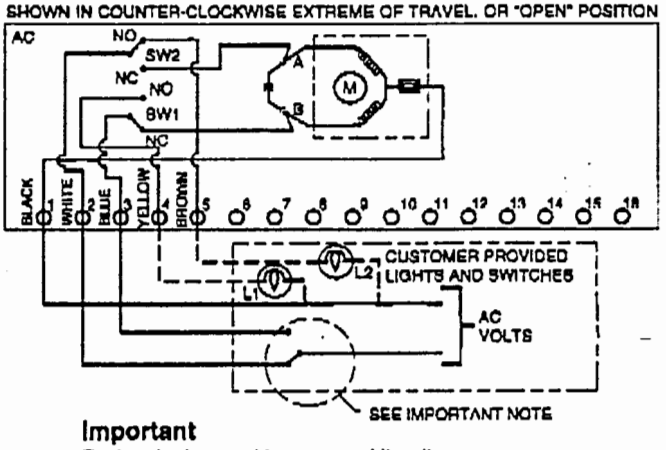
**Consult Factory

N:1 Dimension C for 2-way 1½" valve is 3.46 and for multiport valve is 3.85.

N:2 Dimension C for 2-way 2" valve is 3.67 and for multiport valve is 4.00.

OPTIONS

- Limit switches
  Two additional limit switches may be mounted in the Series 92 for interlocking other equipment, such as pumps, compressors, mixers, or other valves.
- Feedback potentiometer
  When control operation or position feedback information is needed, a 1000 ohm, 1 watt potentiometer with 5% linearity may be installed. Extended duty cycle motor is required if the actuator is to be used in modulating service.
- Heater & thermostat
  For operation at low temperature (to -40° F). The combination of heater and thermostat will maintain the temperature of the case at 40° F. When specified, heater and thermostat come internally wired in the actuator.
- Milliamp positioner
  An all solid state electronic positioner can be installed inside the housing of the Series 92, 50% duty cycle actuator. Standard 4-20 milliampere input signal, or optional 1-5 and 10-50 milliampere, 0-10 VDC. Resistance-type 1000 or 135 ohm inputs. The positioner will give low cost, all electric modulating control capability.
- Voltages - 230 VAC, 12 VDC, 24 VDC, 24 VAC, 12 VAC
- Center off operation
- Mechanical brakes sizes 1½"-4" butterfly valves



Important

Each actuator must be powered thru its own individual switch contacts to avoid cross feed.

Motor has a "Thermal Protector" as shown by ▭ in diagram.

ENGINEERING DATA

Size	Torque	115 VAC		220 VAC		12 VDC		24 VDC		12 VAC		24 VAC		Cycle Time / 90°	Weight
	In/Lbs	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Amp Draw	Duty Cycle	Sec	Lbs
AS2	700	1.3	25%	0.8	25%	4.0	75%	2.0	75%	3.0	75%	6.0	75%	10	10
BS2	1000	1.0	50%	0.8	50%	4.0	75%	2.0	75%	3.0	75%	6.0	75%	25	11

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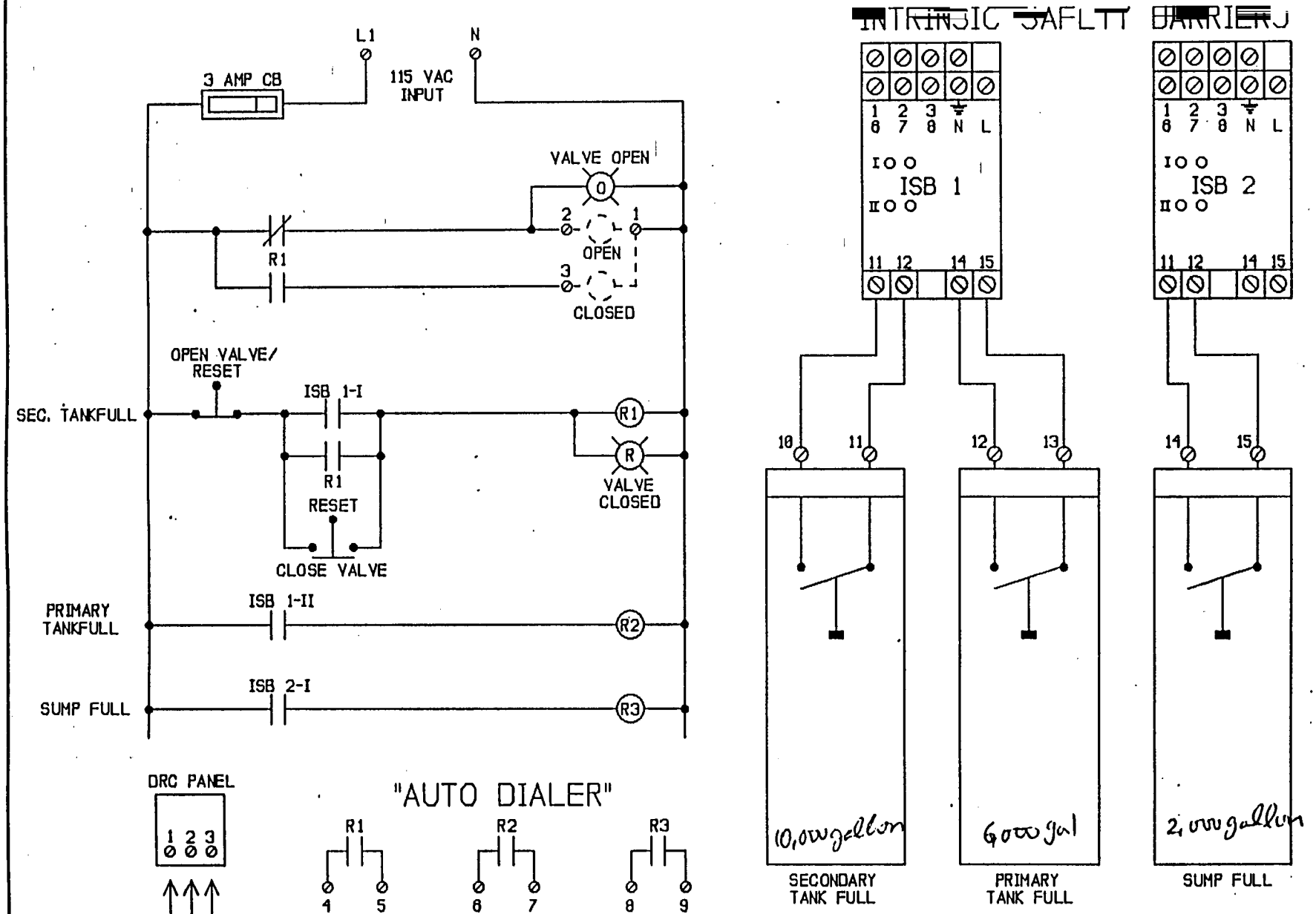
19 Green Street, Malden, MA 02148, U.S.A., Telex: 94-9411, Cable: VALVES MEDF Tel: (617) 321-5409, Fax: (617) 321-4421

ASAHI/AMERICA



NOTE: -TORQUE FIELD WIRING TO 14 IN/LBS.

DIVERSIFIED REMEDIATION CONTROLS, Inc.

PROPERTY OF DRC. Inc. FOR REVIEW ONLY	DATE: 12/17/92	DRAWN BY: M.L.V.

K. SINGH & ASSOC.-VALVE CONTROLLER

DRC JOB #: #634	PROJECT #: 2096-112592-RN	DRAWING #: 951

DiaLog™ Plus

User's Guide

KAYE

DiaLog Plus
User's Guide

Document No. M4560-2
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Contents

Sections

Tables

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1. Introduction

The *DiaLog Plus User's Guide* gives you the basics first, so you can get your system up and running without delay.

Section 2 explains the physical installation procedures.

Section 3 takes you step by step through the small amount of programming required to put DiaLog Plus into operation.

Section 4 is an overview of how the system works and an introduction to DiaLog's many features.

Section 5 explains how to program these features and provides detailed information on each one.

Section 6 covers day-to-day operating procedures.

In this manual, the terms DiaLog Plus and DiaLog are used interchangeably.

2. Installation

This section describes the DiaLog Plus Input/Output (I/O) board and tells you how to test system operation, make the holes for the wiring, connect the telephone, wire the digital inputs and the relay output, make the power connection, and connect a serial printer cable.

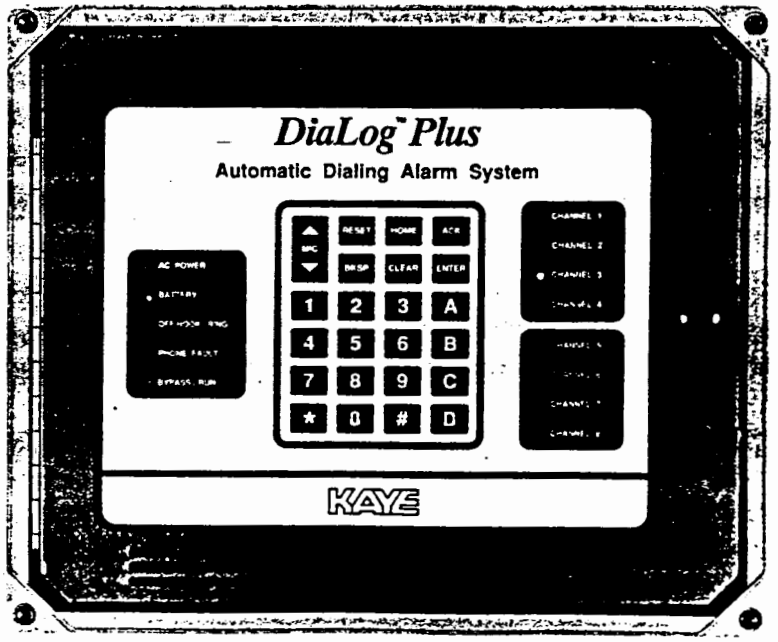
Unpacking

DiaLog Plus is shipped with a telephone cord and cord grip fitting, Recommended Hole Area template, User's Guide, telephone keypad template for use in remote programming, Quick Reference Card, and a ferrite bead for your power cable to provide optimum RF immunity.

I/O board

Accessing the board

To access the DiaLog Plus I/O board, loosen the top and bottom screws on the right side of the enclosure cover and open. Pull firmly on the knob at the right of the front panel.



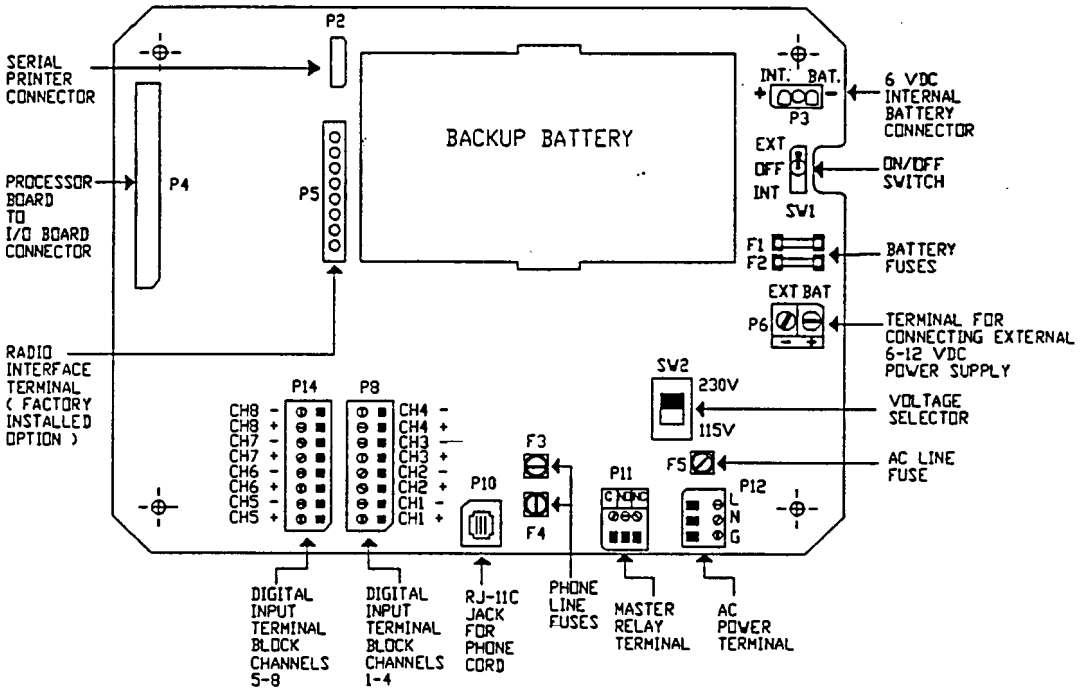


Figure 1. DiaLog Plus I/O Board

Memory Clear

The Memory Clear procedure tests the front panel indicator lights (LED's) and voice, and restores all parameters to the factory settings, ensuring that the system is ready to call out on alarm as soon as you program a list of telephone numbers. If an Access Code has been programmed, you must clear the Access Code before you can clear the memory.

Perform the initial Memory Clear using the internal backup battery power only (AC power not connected).

Power switch

The power switch (SW1 in Figure 1 above) to the right of the battery is shipped in the center (OFF) position. The On position is down, labeled INT (Internal Battery). When the switch is On (INT), DiaLog Plus operates normally from AC power and automatically switches to internal battery power if AC power is disconnected. The EXT (External Battery) position is used only if you are operating from an external 6-12 VDC power source; see External DC Operation (Optional), page 9.

Press and hold the CLEAR key on the front panel while you flip the power switch down to the INT position. DiaLog Plus executes its power up diagnostic tests, running through the following sequence:

- The LED's on the front panel blink on and off several times.
- The BATTERY indicator goes to steady On to show that the system is running on the backup battery.
- The BYPASS/RUN indicator blinks continuously to show that the system is in Bypass mode (ready for programming).
- The system says, "This is DiaLog Plus [firmware version level]. Please wait. Memory Cleared. Setup. Enter Setup selection."

Now turn the power switch Off.

"Please wait" tells you that DiaLog is clearing any extraneous programming from memory. "Memory Cleared. Setup" indicates that all parameters are restored to the factory settings, and that DiaLog Plus is ready for you to make any desired changes in basic parameters such as the Date and Time format or the Printer Port Baud Rate. (Table 2 in Section 4, *How DiaLog Plus Works*, lists the factory settings; Section 5, *Programming*, explains the Setup parameters.)

If DiaLog does not speak the above message, make sure the power switch is Off and repeat the Memory Clear procedure. If you still do not hear the message, note carefully which of the front panel LED's are lit. Remain at the front panel while you call Kaye Customer Service at (800) 343-4624, so you can describe the LED pattern to the Customer Service engineer. The LED's identify which diagnostic test has failed. See Appendix H for details on the power up diagnostics.

Installation environment

The DiaLog Plus enclosure is a NEMA 4X-rated, weathertight, corrosion resistant design. It comes from the factory without any pre-drilled holes, so that you can place the holes in the most appropriate area for your application.

DiaLog does come with a telephone cord, a 115 VAC 3-wire power cord, and fittings. The telephone cord fitting is a snap-in type designed for strain relief only, and is not considered liquid-tight. The power cord fitting is a liquid-tight design, and should work well for most outdoor applications.

Whether you use the factory-supplied fittings or your own wiring/conduit scheme, you may need to take certain measures, such as using a weathertight, corrosion-resistant sealant around the fittings, if you want to maintain the NEMA 4X rating of the enclosure.

Making holes for the connections and mounting the unit

DiaLog Plus comes with a Recommended Hole Area template showing Kaye's suggested placement of holes in the bottom of the enclosure for the digital input, telephone and AC wiring. We advise that you make your holes before you mount the unit, so that you can lay the template on the outside bottom of the case as indicated.

If you need to make holes for a printer cable or the output relay, we suggest these also be in the bottom of the enclosure if there is room. If not, we recommend putting them in the right-hand side of the enclosure.

Open the door and the front panel of the unit before you start cutting, so that you have a better view of what you're doing. *Be careful: damage to DiaLog's electronics with a hole saw or drill bit is not covered under the warranty.* We recommend using a 7/8" Greenlee punch for the factory-supplied AC power cord and grip fitting. The factory-supplied grip fitting for the telephone cord requires a 1/2" diameter hole. If you are not using the cord and fittings supplied by Kaye, be sure the holes are sized properly for the type of cord grip or conduit fitting you are using.

CAUTION

Use a separate hole for each type of wiring. In other words, do not use the same hole for your digital inputs and the telephone, or bring your telephone in with the AC power, no matter how convenient it may seem. Never run digital input wiring (or any signal wiring, for that matter) in the same conduit or wiring trough with AC or high voltage wiring. Failure to adhere to these rules may cause damage to the circuitry.

Mount the unit using the four wall-mounting holes on the outside edge of the enclosure. Use mounting hardware appropriate for the type of wall surface, and be sure the hardware and the surface are strong enough to handle the weight of the unit (13 lbs).

Making the telephone connection

The RJ-11C telephone connector (P10 on Figure 1) is located at the bottom center of the board. Thread one end of the factory-supplied telephone cord through the appropriate hole. Leave enough cord so the connectors meet, but do not plug in yet. Place the fitting around the cord just below where the cord goes into the enclosure. Squeeze the fitting with pliers and snap it into the hole. Then insert the plug into Connector P10, and plug the other end of the cord into an RJ-11C telephone jack.

Connecting the digital inputs

Each digital input channel in DiaLog Plus is designed to monitor a Normally Open or Normally Closed relay.

Terminals for input channels 1-4 are located on Terminal Block 1 (P8 on Figure 1). The terminals are labeled at the right, in ascending order, with Channel 1+ at the bottom and Channel 4- at the top. If you purchased the eight-channel unit, you have a separate four-channel digital input board with Terminal Block 2 (P14 on Figure 1) immediately to the left of Terminal Block 1. Channel 5+ is at the bottom and Channel 8- is at the top.

Notice that each input channel has two terminals, + and -. We recommend that you use two wires for each input channel, to take advantage of DiaLog's superior isolation design. If you are monitoring four dry contact relays, bring in eight wires, as shown in Figure 2. Use cable tie-wraps to help prevent the wiring from pulling loose.

If it is not possible to use two wires for each input channel, you may bring one common (-) wire for all of the input channels into the Channel 1- terminal, and then loop (daisy-chain) the common (-) terminals together starting with Channel 1-. See Figure 3.

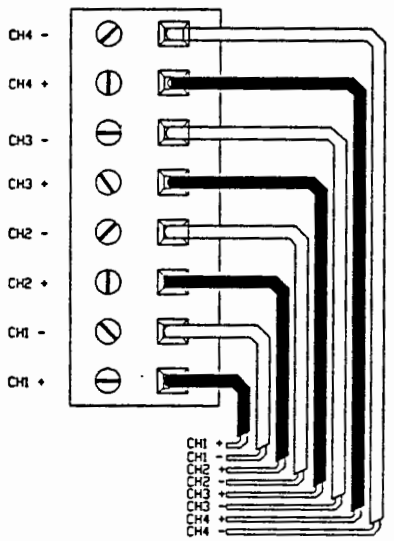


Figure 2. Preferred input wiring: two wires per channel

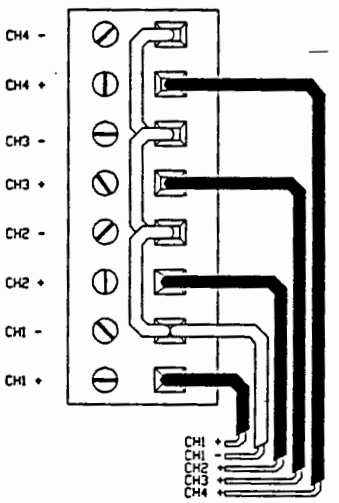


Figure 3. Alternative input wiring: common terminals daisy-chained together

Medium gauge wire (16 to 20 AWG) twisted pair such as Belden #8205 or equivalent is acceptable. You may instead choose to use 8-conductor cable (4-channel unit) or 16-conductor cable (8-channel unit), if all of your dry contact relays are in the same panel.

Total loop resistance for each digital input channel should not exceed 10,000 ohms, or false alarms may occur.

NOTE

If you wish to use open collector transistor or TTL logic inputs instead of dry contact relays, see Appendix B for circuit information.

Connecting the master relay to an external device (optional)

The master relay terminal block is located at the bottom of the board, right of center (P11 on Figure 1). The master relay is energized (On) whenever any channel 0-8 is in an unacknowledged alarm state. This relay is rated at a maximum of 16 amps at 250 VAC or 16 amps at 30 VDC, non-inductive. If you are using an inductive load, see Appendix C for circuit information.

The terminals are labeled left to right: C (Common), NO (Normally Open) and NC (Normally Closed). Route the wiring through a hole in the enclosure and connect your output wires to the appropriate terminals.

Selecting the AC power voltage

DiaLog Plus can operate on either 115 or 230 VAC. (If you are going to use an external DC power source instead of AC power, see the explanation of external DC operation below.)

Select 115 or 230 VAC with the AC voltage selector located on the right side of the board, above the AC terminal block (SW2 on Figure 1).

Connecting AC power

The AC terminal block is located at the bottom of the board, to the right of the relay output terminal (P12 on Figure 1).

Bring in your AC power cord or wiring. DiaLog is shipped with a ferrite bead for the power cable to provide optimum RF immunity. Leave enough cable on the inside of the enclosure to make one turn through the bead before you connect the wires to the terminal. See Figure 4.

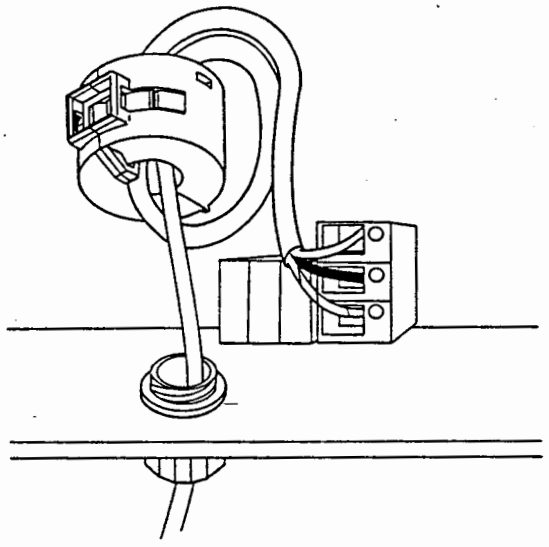


Figure 4. Ferrite bead installation

The terminal labels are to the right of the block, on the board: L=Line (black), N=Neutral (white), G=Ground (green).

Plug in or connect the other end of the AC cord or wiring to an AC power source, and turn the power switch On (INT). Check to make sure the AC POWER indicator on the front panel lights up.

CAUTION

Failure to supply a good earth ground for the AC power will cause DiaLog's integral surge and lightning protection to be ineffective.

External DC operation (optional)

For applications where standard AC power is not available, DiaLog Plus has a separate terminal for wiring to an external 6-12 VDC power source, such as a solar-charged battery bank. See *Appendix A*, Specifications for power requirements.

The terminal is located on the right edge of the I/O board, in the center (P6 in Figure 1). The negative and positive terminals are labeled on the board. Bring the external leads in through a hole in the enclosure and attach to the appropriate terminals.

To turn DiaLog Plus on, flip the power switch up to the EXT (External Battery) position. The BATTERY indicator will light. Be sure to disable Channel 0 (Power Fail) or set it to Status Only, so the system will not make alarm callouts when it detects AC power lost (see Channel Mode in Section 5, *Programming*).

CAUTION

The DiaLog Plus internal backup battery is inoperable when you are using external DC power.

Adjusting the speaker volume

The speaker is located behind the grille at the bottom left of the front panel. The potentiometer for adjusting the speaker volume is just to the left of the speaker (RV1 on Figure 5). To increase the volume, turn the potentiometer clockwise. To decrease the volume, turn counterclockwise. Treat the potentiomenter with care so that its mounting wires do not bend.

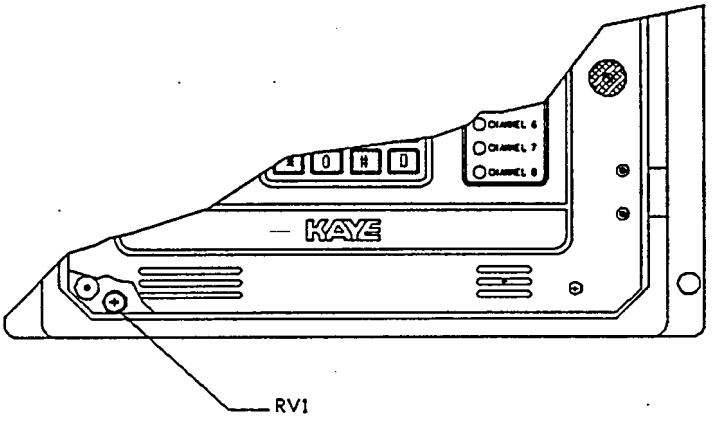


Figure 5. Speaker volume potentiometer

Connecting the printer (optional)

The 9-pin RS-232C serial port for connecting an optional printer or terminal is at the top of the I/O board immediately to the left of the battery (P2 on Figure 1). Make a hole in the enclosure the appropriate size for the printer cable.

The serial port is identical to the standard 9-pin serial port on the IBM PC/AT. The cable pin assignments at the DiaLog are as follows:

Pin number	*Signal Description*
1	Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator

The printer port is factory set for 1200 baud, 8 data bits, no parity and 1 stop bit. Check your printer manual for its communication requirements. Then, if you need to program different values, select Setup and then Printer Port. See Section 5, *Programming* for more information.

Connecting the radio interface (optional)

If you ordered the optional radio interface, locate the radio relay terminal block (P5 in Figure 1). The terminals are numbered 1-8, top to bottom. Connect Terminal 1 (Normally Open) and Terminal 2 (common) to the PTT switch on your radio transmitter.

Connect Terminals 5 and 6 to the radio transmitter microphone input. DiaLog's output signal is 0 DBM with 600Ω source impedance. To control the volume, see the diagram in Appendix D.

To program DiaLog Plus to transmit alarms over the radio, see Telephone Numbers in Section 5, *Programming*.

3. Quick Start

This section is designed with the majority of DiaLog Plus users in mind, and will work for you if:

- Your application is strictly alarm call-out.
- You want DiaLog to call out any time an alarm occurs, day or night. In other words, you want the system armed 24 hours a day.
- You need to call just one list of telephone numbers, no matter what alarm occurs.
- You need to call a maximum of 8 telephone numbers.
- You are not calling a display pager.

If your needs differ from the above, skip Quick Start and read Sections 4, 5 and 6.

All you need to program is one list of telephone numbers.

This section tells you how to program a list of telephone numbers. Once you have done this, DiaLog takes over alarm notification, using its factory settings. When an alarm occurs, any time of day or night, seven days a week, DiaLog calls the telephone numbers on the list, in sequential order, until it makes a connection. It delivers a factory-programmed alarm message and waits for an acknowledgement. If there is no acknowledgement, DiaLog calls the next number on the list.

Although you can use the factory-programmed alarm messages, most people want to record their own, so we include instructions on how to program a customized message for one channel. You can then use the instructions to record alarm messages for all your channels.

Also included here are an explanation of the front panel indicators and instructions for testing DiaLog to make sure it is calling out when an alarm occurs.

Front panel indicators

Table 1 lists and explains the LED's on the front panel.

Table 1. Front Panel LED's

Indicator	*Steady On*	*Blinking*
● AC POWER	AC power On	AC power lost
● BATTERY	System on battery backup or external DC power	AC power lost: battery low AC power reapplied: battery charging
● OFF HOOK/RING	Incoming/outgoing call in progress	Incoming call ring
● PHONE FAULT	Line failure	– – –
● BYPASS/RUN	Run mode	Bypass mode
● CHANNEL 1-8	Acknowledged alarm	Unacknowledged alarm

AC POWER and BATTERY indicators

The AC POWER indicator blinks if DiaLog powers up with AC and then loses power. The BATTERY indicator blinks if DiaLog has lost AC power, is running off the backup battery and the battery is low. The BATTERY indicator also blinks when AC power is restored after a power loss, and the battery is charging.

BYPASS/RUN

DiaLog has two modes: Bypass and Run. Bypass mode is for programming and certain other tasks, while Run is the normal operating mode. Press 1 at the front panel for Bypass, and 2 for Run mode.

When you first power up, the system is in Bypass mode. The BYPASS/RUN indicator is blinking and DiaLog prompts, "This is DiaLog Plus [firmware version number]. Please wait. Memory cleared. Setup. Enter Setup selection." Since you will not be entering any Setup selections, press HOME for the "System ready; enter selection" prompt.

After you finish programming, or if you take a break in a programming session, press 2 to put DiaLog into Run mode. DiaLog Plus responds, "Run mode. Please wait." There is a delay while the system stores your program changes, and then you hear "Run mode activated. System ready." In Run mode, the BYPASS/RUN indicator is steady On.

The system must be in Run mode in order to make alarm calls. Also, your programming, with the exception of messages, is not saved until DiaLog goes from Bypass to Run.

CHANNEL alarm indicators

The red Channel indicators light when a channel is in alarm/On. Blinking indicates an unacknowledged alarm, while steady On indicates an alarm that is acknowledged but not corrected.

Programming telephone numbers

DiaLog Plus can hold up to 64 telephone numbers: 8 lists of 8 or 4 lists of 16. Your system is factory-set for 8 lists of 8. The following instructions tell you how to program a telephone number in Telephone List 1, Position 1. When an alarm occurs, DiaLog Plus will call that number first.

At the "System ready; enter selection" prompt, follow the sequence below.

What you enter	*What DiaLog Says*
6 (System Configuration)	"System configuration. Enter System selection."
3 (Telephone Numbers)	"Telephone Numbers. Enter List Number or press Pound (#) to exit."
1	"Telephone List 1. Enter List Position. "
1	"Telephone List 1, Position 1. The present number is disabled. Enter new telephone number or press Pound (#) if OK."
A telephone number of up to 35 digits or special characters (see Section 5, page 41 for special characters); then ENTER	"The new number is _____."
	"Telephone List 1. Enter List Position."
	(DiaLog prompts you to enter up to 8 telephone numbers in List 1, Positions 1-8. You can exit the Telephone Numbers selection at any time by pressing HOME, as shown below.)
HOME	"System ready. Enter selection."

If this is all the programming you plan to do, press 2 to save your entries and put the system into Run mode.

Programming an alarm message (optional)

When any input channel goes into alarm, DiaLog Plus calls the number you entered in Telephone List 1, Position 1 and delivers a factory-programmed message. However, you can record your own alarm messages. These instructions tell you how to record a message for Channel 1, the first digital input.

DiaLog's microphone is located behind the grille on the bottom right of the front panel. It turns on automatically when the tone prompt sounds, and turns off at the end of the recording period. Speak clearly about 6" from the mike.

Unlike other program changes, your customized messages are saved as you record them. When you finish, you hear a "Please wait" prompt, which indicates that DiaLog Plus is saving the message into memory. Your message is repeated back, and then you are prompted again to enter a channel selection. Since you will not be programming other parameters, ignore this prompt.

At the "System ready; enter selection" prompt, follow the sequence below.

What you enter	*What DiaLog Says*
9 (Channel Configuration)	"Channel configuration. Enter channel number."
1	"**Channel 1, Digital Input.** Enter channel selection."
1 (Channel Messages)	"**Channel Messages.** The present selection is one 8-second message. Enter new selection or press Pound (#) if OK."
#	"**8-second Alarm or On message.** The present message is 'Channel 1, Digital Input, is in alarm.' Press Pound (#) if OK or 1 to record new message at the tone."
1	(Tone sounds.)
Speak your message into the mike.	(Tone sounds.) "Please wait."
	"The new message is _____."
	"Channel 1, Digital Input. Enter channel selection."
HOME	"System ready. Enter selection."

Press 2 when you finish programming to put DiaLog into Run mode.

Testing the system

This test assumes that DiaLog has AC power, is connected to the phone system, has a digital input wired into Channel 1+ and 1- on the I/O board, and none of the CHANNEL indicators are on.

To make sure DiaLog is working, force Channel 1 into alarm. Verify that the system is in Run mode (RUN/BYPASS indicator steady ON) and check for the following:

- The CHANNEL 1 Alarm Indicator on the operator panel is blinking.
- The red OFF HOOK/RING indicator is lit to show that the system is attempting to dial the first telephone number on List 1.

To acknowledge the alarm at the operator panel, press ACK. The red channel indicator goes from blinking (unacknowledged alarm) to steady ON (alarm acknowledged but not corrected).

Complete the test by correcting the alarm at Channel 1.

For more information

To learn about how DiaLog Plus operates and what it can do for you, turn to Section 4, *How DiaLog Plus Works.*

To change the factory settings, turn to Section 5, *Programming.*

To learn how to acknowledge an alarm, cancel an alarm callout, request a Status Report, switch modes from Run to Bypass, make outgoing calls, listen in to activity near the system, and print configuration reports, turn to Section 6, *Using DiaLog Plus.*

4. How DiaLog Plus Works

This section of the User's Guide gives you an overview of how DiaLog Plus operates. The description assumes the system is running with its factory settings, except for the telephone numbers you programmed into List 1 in *Quick Start*. The factory settings are listed in Table 2 at the end of this section.

Where applicable, we describe programming changes you can make to customize the way DiaLog Plus works.

Italicized terms in the text are defined fully in Section 5, *Programming* and in the Glossary.

What is DiaLog Plus?

There are two versions of DiaLog Plus: 8-input and 4-input. Each input is associated with a channel. DiaLog continuously monitors all input channels as well as its own AC power line, Channel 0. If an alarm condition or a power failure occurs, the system sends a factory-programmed voice message over standard telephone lines and alerts you to the problem. You can record your own customized *System Identification Message* and *Channel Alarm Messages*.

The system also has one master relay that you can connect to an external siren, beacon or other device. When an alarm occurs, DiaLog Plus automatically energizes the relay, turning on your external device.

Programming

The system has two modes: *Bypass* mode for programming and *Run* mode for normal operation. (DiaLog Plus must be in Run mode to make alarm callouts, and any programming you do is not saved until you put it into Run mode.) In Bypass mode, the RUN/BYPASS indicator on the front panel blinks, while in Run mode the indicator is steady On.

DiaLog Plus powers up in Bypass mode and prompts for a programming selection. If there is an *Access Code* (password) programmed, you must enter the code before you can enter a programming selection.

You can program the system through the built-in keypad or from a remote Touch-Tone™ telephone. Voice prompts guide you through the programming.

At a minimum, you must program DiaLog Plus with at least one telephone number. DiaLog calls that number when an alarm occurs. The number can be a paging device.

When you finish programming, press 2 to put DiaLog into Run mode. If you overlook this step, the system automatically switches into Run mode after a 60-minute *Bypass to Run Delay*, ensuring that DiaLog is not inadvertently left in a nonfunctioning state. You can program a shorter or longer Bypass to Run Delay period.

At the switch to Run mode, the system says "Please wait" as it stores programming changes to memory, and then "Run mode activated."

Alarm notification

DiaLog Plus digital input *Channel States* are factory set as Normally Open. If you want, you can change individual channels to Normally Closed. When a Channel State changes from normal or a power failure occurs, DiaLog waits for a 3-second *Alarm Delay* period to make sure the channel is actually in alarm, and then begins alarm callouts. You can change the length of the Alarm Delay period.

The front panel alarm indicator for the channel in alarm begins to blink and the OFF HOOK/RING indicator goes steady On.

Individually targeted alarm destinations

DiaLog Plus automatically dials the first number on *Telephone List* 1, although you can program the system to dial a different list of numbers. You can program up to 8 lists of 8 numbers, or 4 lists of 16 numbers, and assign each digital input channel to any one of the lists. This way, you can target alarms to specific destinations. For example, you can direct cooling and heating failures to your mechanics, hazardous material leakage to emergency teams, and intrusion alarms to security.

Alarms are prioritized by their Telephone List number, with List 1 the highest and List 8 the lowest.

DiaLog rings the first number on the Telephone List for up to 30 seconds. If the line is busy or the telephone is not answered during the 30-second period, the system dials the second number. It repeats this sequence until someone answers. If you want DiaLog to call back a busy number, you can enable the *Redial Number* feature. Then the system will try a number twice before it moves on to the next number on the list.

When the call is answered, DiaLog identifies itself, delivers the message for the channel in alarm, and says "Please acknowledge." It repeats this sequence three times. You can change the number of *Message Repeats*.

Alarm response

The person answering the call acknowledges it by pressing the * or 8 key on a Touch-Tone telephone within 4 seconds after Dialog requests an acknowledgement. If the call is picked up by an answering machine, or by a child or anyone else who does not know how to acknowledge it, DiaLog automatically calls the next number on the list.

DiaLog will accept a return call as an acknowledgement of all alarms if you enable the *Call In Acknowledge* feature. The call must come during the 30-second *Between Calls Delay,* or DiaLog calls the next number on the list. You can increase or decrease the Between Calls Delay period.

If an alarm clears during the Between Calls Delay, the callout sequence for that alarm is automatically cancelled.

Once an acknowledgement is received, DiaLog goes into a 60-minute *Redial After Acknowledge Delay*. This delay can be increased or decreased. If the alarm is not cleared by the end of this period, DiaLog repeats the calling sequence.

If a channel with a higher alarm priority goes into alarm during a callout, the lower priority call sequence is interrupted within 10 seconds after DiaLog terminates the current call. When DiaLog gets an acknowledgement of the higher priority alarm, it restarts the calling sequence for the lower priority alarm. If channels with the same priority are in alarm at the same time, DiaLog Plus delivers the alarm messages for all these channels. The system automatically updates its messages during a notification call to reflect a new alarm.

Disarmed timetable

Because DiaLog Plus has a built-in clock, you can set up a *Disarmed/Armed Schedule* that automatically disables alarm callouts during certain times of the day. This is useful for locations that are staffed on weekdays but unattended in the evenings and during the weekend. For example, you can program DiaLog Plus to disarm itself Monday through Friday from 8:00 A.M. to 5:00 P.M. while your site is staffed, and then automatically arm itself from 5:00 P.M. to 8:00 A.M., and round the clock Saturdays, Sundays and holidays. You can also program a *Holiday Calendar*, assigning holiday status to up to 20 days in a year.

Flexible notification

All input channels are factory-set to call out on alarm, but you can change the *Channel Mode* of any channel. For instance, you can temporarily disable a channel that is monitoring equipment under repair, so the channel does not trigger alarm calls and is not included in a status report. Or, you can designate a channel Status Only, so you can call in to find out whether it is On or Off but it does not make alarm notifications.

Alternatively, you can program a channel to call out when a Limit is reached. You set the *Channel Limits* for the two counters associated with each channel: the *Totalizer*, which counts the number of times the channel goes into the On state, and the *Duration Counter*, which keeps track of how long the channel stays in an On state. The *Counter Resets* feature lets you do a real-time manual reset of the Totalizer and Duration Counters.

Status reports

You can call DiaLog Plus anytime and find out the current system status as well as the status of a specific input channel or all input channels. This virtually eliminates routine inspection trips to unattended sites or remote areas of large facilities.

DiaLog is factory-set to wait for two rings before it answers a call. However, if the system shares a telephone line, you can increase the *Ring Count* to make sure that an employee has time to answer before DiaLog picks up the call.

Status callouts

You can program DiaLog to make *Status Notification* calls up to 4 times a day, weekdays, weekends and holidays, with a system status report.

Listen In

You can also call and *Listen In* to nearby noises picked up by DiaLog's internal microphone. For example, you can call in and determine if a pump is running or the chiller is operating. You can adjust the *Microphone Level* with a programming command.

Hard copy documentation

Simply attach a serial printer to the RS-232 port for a printout identifying each alarm, when it occurred, and the telephone numbers DiaLog attempted to call. The printout indicates the results of the call, such as busy signal, no answer or alarm acknowledged. The printer also logs calls answered by DiaLog Plus, any changes made to the program, and mode changes (BYPASS to RUN or vice versa). All events are stamped with the date and time. DiaLog Plus is factory-set for U.S. *Date Format* and 24-hour *Time Format*, but you can select from five date formats and choose a 12-hour clock. You can also reconfigure the *Printer Port* with a few keystrokes.

DiaLog Plus has a 1000-byte printer buffer that can store the most recent 14 to 16 events in memory. When the printer is connected or powered on, the events are printed.

Instead of a printer, you can connect a terminal to the RS-232 port and monitor DiaLog's activities on screen.

DiaLog Plus can also print a complete summary of all configured parameters, including telephone numbers, or partial summaries of specified parameters.

Automatic battery backup

The standard 6 VDC internal backup battery maintains operating power to DiaLog Plus for a minimum of 16 hours at 86°F in the event of AC power loss. The switch-over to battery operation is automatic; no operator intervention or reprogramming is required. An alarm notification call alerts the first available person on Telephone List 1 with the message, " Channel 0 is in alarm; system on battery backup." The POWER indicator on the front panel goes off and the BATTERY indicator goes steady On.

If the battery charge drops below a certain level, the message "System battery is low" is delivered in the System Status report, and the BATTERY indicator blinks intermittently. See Appendix J for the battery test procedure and estimated power fail reserve capacity.

While AC power is On, the BATTERY indicator blinks at the normal blink rate when the battery is charging. The battery will recharge as long as AC power is connected, even if the power switch is Off. The standard factory-installed battery requires 20 hours to recharge completely; the optional extended backup battery takes approximately 33 hours to recharge.

If the battery fails to take a charge while the system is operating from primary AC power, the System Status report includes the message, "System battery is bad." When you hear this message, we strongly recommend that you replace the battery. The message may indicate a blown battery fuse instead of a bad battery. Check the fuse (F1 on the main board).

While all user-programmed messages and parameters are saved permanently in nonvolatile memory, if you turn the power switch off (for example, to install an expansion board), or if there is an AC power loss *and* DiaLog's backup battery has no charge, the date and time will be reset to 90/01/01, the totalizer and duration counters will be reset to 0, and any stored printer messages will be lost.

Local telephone communications

Because DiaLog contains a speaker and microphone, an operator at the site can use it as a speaker phone, dialing out manually and speaking normally into the microphone.

DiaLog Plus automatically detects voice activity at one end of the line or the other, and gives the current speaker the line. At the front panel, either the speaker or the microphone is activated, but not both at the same time.

Telephone line test

DiaLog Plus tests the phone line every two hours. The OFF HOOK indicator lights as the system checks for a dial tone. If DiaLog does not detect a dial tone, it lights the PHONE FAULT indicator.

For more information

Turn to Section 5, *Programming* for instructions on changing the DiaLog Plus factory settings. You do not have to program all the parameters; you may want to leave most of the settings alone and just program a few more telephone numbers and messages. In this case, the Quick Start directions may be adequate.

Section 6, *Using DiaLog Plus*, tells you how to acknowledge alarms, cancel an alarm callout, request a Status Report, switch modes from Run to Bypass and vice versa, make outgoing calls, listen in to activity near the system, print configuration reports, and do a manual reset of the channel counters.

Table 2. DiaLog Plus Factory Settings

Date and Time Format	mm/dd/yy (U.S.); 24-hour clock
Telephone Lists	8 lists of 8 numbers
Call In Acknowledge	Disabled
Redial Number	Disabled
Printer Port	1200 baud, 8 data bits, parity disabled; 1 stop bit
Audio Settings	Speaker On; Microphone level 5
System Identification Message; Number	"This is DiaLog Plus"; 1
Date and Time	90/01/01; 00:00:00
Access Code (password)	Disabled (0000)
Telephone Numbers	Disabled
Message Repeat	3
Ring Count	2
Delays	Bypass/Run - 60 minutes Between Calls - 30 seconds Redial After Acknowledge - 60 minutes
Status Notification	No entries
Disarmed/Armed Schedule	Disabled (always armed)
Holiday Calendar	No entries
Digital Input Channels:	
Channel State	Normally Open
Channel Messages	Alarm/On: "Channel *n* is in alarm." Normal/Off: "Channel *n* is normal."
Channel Mode	Call on Alarm
Continue Notification if Return to Normal before Acknowledged	Disabled
Channel Telephone List	List 1 (Highest priority)
Channel Alarm Delay	3 seconds
Channel Limits	Totalizer = 32767 Duration counter = 120 minutes

5. Programming DiaLog Plus

This section of the User's Guide describes the front panel keypad and the equivalent key sequences at a remote telephone. It provides general programming guidelines and tips, and step-by-step instructions for programming each DiaLog Plus feature. Programming forms are included at the end of the section.

Keys

You can program DiaLog Plus either through the front panel keypad or from a remote Touch-Tone telephone.

Remote programming

When you call DiaLog, you hear a System Status report followed by three beeps. Press # (ENTER), then 1 (BYPASS) at the "System ready" prompt to begin programming. Use the Touch-Tone keypad template shipped with your system as a programming aid.

Front panel keypad

The front panel keypad includes five shortcut keys to speed up programming: ENTER, BKSP, CLEAR, RESET, and HOME. In addition, the ACK key acknowledges all channels in alarm, and the MIC key lets you adjust the microphone pickup levels. You can perform the same functions at a remote telephone using combinations of the standard 12 keys. When you use * (Star) with another key, hold down * while you press the numeric key.

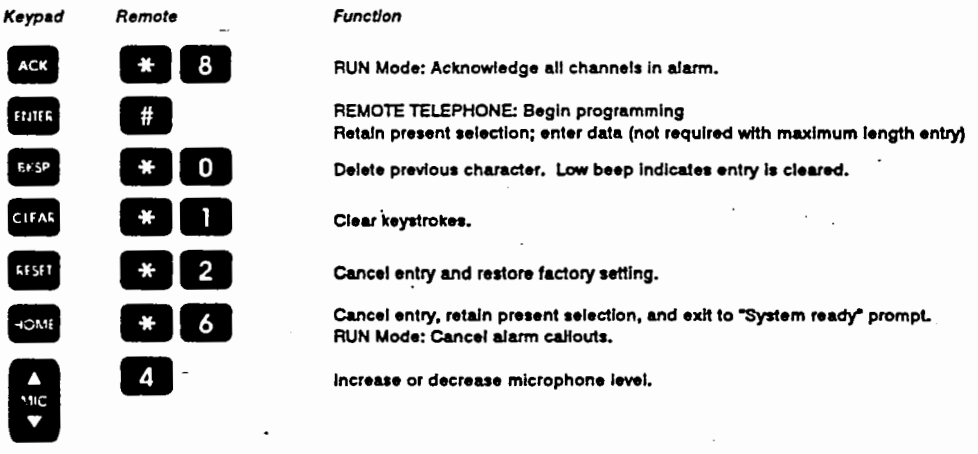


Figure 6. Front Panel Shortcut Keys

Entering data and editing

The shortcut programming keys and their remote equivalents are used for entering data and editing entries. For instance:

- Press ENTER or Pound (#) immediately after a "Press Pound (#) if OK" prompt to retain the present value in a parameter.
- Press ENTER or Pound (#) to terminate a numerical entry such as a telephone number, delay, or limit when you enter fewer than the maximum number of digits.
- Press HOME (*6) to cancel an entry and exit to the "System ready. Enter selection" prompt.
- Press RESET (*2) at the "Enter new selection" prompt to restore the factory setting and return to the previous prompt.
- Press RESET (*2) at the "Channel *n*. Enter channel selection" prompt to deselect the channel and exit to the "Enter channel number" prompt.
- Press CLEAR (*1) in the middle of an entry to clear the keystrokes and return to the current prompt.
- Press BKSP (*0) to delete the previous character. A low beep tells you when the entire entry is cleared.

The front panel keys labelled A, B, C and D let you use these Touch-Tones in a radio keying or paging application.

With the exception of the shortcut and A-D keys, and the requirement that you press # (ENTER) to start programming from a remote phone, DiaLog Plus programming is identical both at the front panel and from remote telephones. Table 3 shows all the programming selections, organized into four main areas:

Setup (3)
Audio Settings (4)
System Configuration (6)
Channel Configuration (9)

Working your way through the programming selections

You select an area, then make selections within the area. For example, press 3 to select Setup, then any key 0-4 for a Setup selection. When you finish programming a selection, you are still in the Setup area, and DiaLog prompts you to make another Setup selection. You do not have to press 3 again to select Setup; if you do press 3, you will hear the "Redial Number" prompt.

This section describes only the programming selections. The keys used for day-to-day operation of the system, such as ACK (*), Status (0), Bypass (1), Run (2), Call Out/Listen In (5) and Print Report (8) are discussed in Section 6, *Using DiaLog Plus*.

Voice Prompts

When you power up for the first time or after clearing the memory, DiaLog Plus responds with "This is DiaLog Plus. Please wait. Memory cleared. Setup. Enter Setup selection." If you do not want to enter Setup parameters, press HOME (*6) for the "System ready" prompt.

Table 3. DiaLog Plus Programming Selections

Keys	Selection	Factory setting
HOME then 0	**System Status**	
	n Single channel	
	* * All channels	
HOME then 1	**Bypass mode**	Bypass mode at power up.
HOME then 2	**Run mode**	
HOME then 3	**Setup**	
0	▸ Date/Time Format	0(mm/dd/yy)
	0 mm/dd/yy hh:mm:ss 3 dd/mm/yy hh:mm:ss	
	1 yy-mm-dd hh:mm:ss 4 dd mm yy hh:mm:ss	
	2 dd.mm.yy hh.mm.ss	
	▸ Clock Format	0 (24-hour)
	0 24-hour 1 12-hour	
1	Telephone Lists	0 (8 lists of 8)
	0 8 lists of 8 1 4 lists of 16	
2	Call In Acknowledge	0 (Disabled)
	0 Disabled 1 Enabled	
3	Redial Number	0 (Disabled)
	0 Disabled 1 Enabled	
4	Printer Port	
	▸ Baud rate	1 (1200 baud)
	0 300 1 1200 2 2400 1 9600	
	▸ Data bits	1 (8 data bits)
	0 7 bits 1 8 bits	
	▸ Parity	0 (Disabled)
	0 Dsab 1 Odd 2 Even	
	▸ Stop bits	0 (1 stop bit)
	0 1 bit 1 2 bits	
5	Firmware version	
HOME then 4	**Audio Settings**	
	▸ Speaker	1 (On)
	0 Off 1 On	
	▸ Microphone level	5
	0 Minimum . . . to 7 Maximum	

Table 3. DiaLog Plus Programming Selections, continued

Keys	Selection	Factory setting
HOME then 5	**Speaker Phone/Listen In**	
HOME then 6	**System Configuration**	
0	System Identification	
	▸ 8-second voice message	"This is DiaLog Plus."
	▸ 18 characters, 0-9, A-D, * and #	(1)
1	Date and Time	
	▸ yy/mm/dd	90/01/01
	▸ hh:mm:ss	00:00:00
2	Access Code, 4 digits	0000
3	Telephone Numbers	Disabled
	▸ List 1-8 (or 1-4)	
	▸ List Position 1-8 (or 1-16)	
	▸ Telephone number, up to 35 digits 0-9 and special characters:	
	* 5 Radio transmission (K)	* # # tone (#)
	* 7 Pager (P)	A A tone (A)
	* 8 Dial tone detect (T)	B B tone (B)
	* 9 2-second delay (W)	C C tone (C)
	* * * tone (*)	D D tone (D)
4	Message Repeat 1-20	(3)
5	Ring Count 1-20	(2)
6	Delays	
	▸ Bypass to Run, 0-999 minutes	60 minutes
	▸ Between Calls, 10-9999 seconds	30 seconds
	▸ Redial After Acknowledge, 1-9999 minutes	60 minutes
7	Status Notification (7 days plus holiday)	No entries
	▸ Day 1-8	
	▸ Telephone List 1-8 (or 1-4)	
	▸ Up to 4 notification times, hh/mm	
8	Disarmed/Armed (7 days plus holiday)	Disabled
	▸ Day 1-8	
	▸ Disarmed time, hh/mm	
	▸ Armed time, hh/mm	
9	Holiday Calendar, 20 dates, mm/dd	No entries

Table 3. DiaLog Plus Programming Selections, continued

Keys	Selection	Factory setting
HOME then 8	**Print Configuration Report**	
	0 Setup	
	1 System Configuration	
	2 Channel Configuration	
	n Single channel	
	* * All channels	
	3 Telephone Lists	
HOME then 9	**Channel Configuration**	
	▸ Channel number	
	* 4 Global (enter this command *after* a channel selection)	
	0 Channel State	0
	0 Normally Open 1 Normally Closed	
	1 Channel Messages	"Channel *n* is in alarm."
	0 One 8-second alarm message	
	1 Two 4-second messages	
	2 Channel Mode	2
	0 Disabled	
	1 Status Only	
	2 Call on Alarm	
	▸ Continue notification if normal	0
	0 Disabled 1 Enabled	
	3 Call on Limit	
	3 Telephone List 1-8 (or 1-4)	1
	4 Alarm Delay, 1-9999 seconds	3 seconds
	5 Limits	
	▸ Totalizer Limit, 0-32767	32767
	▸ Duration Limit, 0-9999 minutes	120 minutes
	6 Resets	
	▸ Totalizer reset, 0-32767	
	▸ Duration reset, 0-9999 minutes	

Step-by-step help

As you enter keystrokes, DiaLog Plus prompts you at each step, confirming your entry, stating the present selection, and cueing your next entry. At the front panel, you can interrupt the prompt by entering a valid keystroke. At a remote telephone, wait until DiaLog stops speaking before you make an entry.

If you press an incorrect key during an entry, DiaLog Plus prompts, "Invalid keystroke." You can either continue the programming sequence or exit with HOME or *6. If you make an incorrect entry, you are prompted, "Invalid entry." Re-enter the parameter. DiaLog also delivers voice messages when it goes from Run to Bypass mode or vice versa, requires programming for a new holiday calendar, or terminates a call. After you record a message and when you go into Run mode, you hear "Please wait" while the system processes and stores your message or program into nonvolatile memory.

Getting ready to program

Plan the program before you begin.

We recommend that before you begin, you write out your program, including your customized messages, the lists of telephone numbers, and the telephone priority for each channel. A written program can help you quickly pick up where you left off if you are interrupted. Use the programming forms at the end of this section (before you write, make copies of the forms for future use).

START HERE

Activate Bypass mode to program.

When you are ready, press 1 (BYPASS) at the front panel to put DiaLog Plus into Bypass mode for programming. Enter the access code if required. DiaLog Plus responds, "Bypass mode activated. System ready."

From a remote Touch-Tone telephone, dial DiaLog's number. After the System Status message and the three beeps, press # (ENTER) to program, then 1 (BYPASS). Enter the access code if required.

Press HOME for the "System ready" prompt.

If you are interrupted in the middle of a programming sequence and cannot remember where you were, press HOME to cancel the entry and start again. Any time you hear the "System ready; enter selection" prompt, you can select one of the main programming areas: Setup (3), Audio Settings (4), System Configuration (6) or Channel Configuration (9).

Checking your entries

To verify what you have entered, just re-select the parameter. DiaLog Plus states the present value or selection. All you have to do is press ENTER or Pound (#) at the "Press Pound (#) if OK" prompt.

3 Setup

Generally speaking, the Setup parameters are a one-time task. Set these parameters first, because they affect the way other parameters are programmed.

You automatically hear the "Setup. Enter Setup selection" prompt when you power up DiaLog Plus for the first time or if you do a Memory Clear (see Section 2, Installation). When you power up an already programmed DiaLog system, you are automatically in Bypass mode; at the "System ready. Enter selection" prompt, press 3 (Setup) and enter the desired selection. Table 4 summarizes the Setup parameters.

Table 4. Setup

Key	*Selection*	
3	SETUP	
	0	▸ Date/Time Format
		▸ Clock Format
	1	Telephone Lists
	2	Call In Acknowledge
	3	Redial Number
	4	Printer Port
		▸ Baud rate
		▸ Data bits
		▸ Parity
		▸ Stop bits
	5	Firmware Version

Setup parameters are not logged to an optional printer. For a hard copy, print a configuration report of the Setup selections.

The examples that follow assume you are in the Setup area.

PRESS 3 THEN 0

0 Date/Time and Clock Format

This selection lets you pick one of five international date and time formats and choose a 24-hour or 12-hour clock. Your selections determine the way the date and time are spoken and printed.

NOTE

To program the current date and time, see System Configuration (6), Date and Time (1).

The factory settings for Date/Time and Clock Format are mm/dd/yy, hh:mm:ss (US), and 24-hour.

What you enter	*What DiaLog says*
0 (Date/Time and Clock)	**"Date and Time format.** The present selection is 0. Enter new selection or press Pound (#) if OK."
0 - mm/dd/yy hh:mm:ss 1 - yy-mm-dd hh:mm:ss 2 - dd.mm.yy hh.mm.ss 3 - dd/mm/yy hh:mm:ss 4 - dd mm yy hh:mm:ss	"The new selection is __."
	"Clock format. The present selection is 24-hour. Enter new selection or press Pound (#) if OK."
0 - 24-hour 1 - 12-hour	"The new selection is __-hour.
	"Setup. Enter Setup selection."

1 Telephone Lists

This selection lets you specify the number of telephone lists. The choices are 8 lists of 8 numbers or 4 lists of 16 numbers.

Channel alarm priority is determined by the telephone list assigned to the channel. List 1 always has the highest priority, with priority going down as the list number goes up.

The number of alarm priorities in the system depends on the number of lists. If you choose 8 lists, you can assign a priority of 1 to 8 to the input channels; 4 lists lets you assign a priority of 1 to 4.

The factory setting is 8 lists of 8 numbers.

What you enter	*What DiaLog says*
1 (Telephone Lists)	"Telephone lists. The present selection is 8 lists. Enter new selection or press Pound (#) if OK." ← Do
0 - 8 lists of 8 numbers 1 - 4 lists of 16 numbers	"The new selection is _ lists.
	"Setup. Enter Setup selection."

Press (2)

2 Call In Acknowledge

This selection lets you specify whether or not DiaLog Plus will accept a call during the Between Calls Delay as an alarm acknowledgement. You can enable or disable this feature.

The advantage of enabling Call In Acknowledge is that a person who receives alarm notification via a pager can call in an acknowledgement. Also, a person with a rotary dial telephone can call back to acknowledge an alarm.

The disadvantage of enabling Call In Acknowledge is that a stray call can accidentally acknowledge all alarms. For example, if a person not on the telephone list for a channel in alarm calls in during the Between Calls Delay to check system status or to listen in, DiaLog Plus interprets the call as an alarm acknowledgement.

The factory setting for Call In Acknowledge is Disabled.

What you enter	*What DiaLog says*
2 (Call In Acknowledge)	"Call In Acknowledge. The present selection is Disabled. Enter new selection or press Pound (#) if OK."
0 - Disabled 1 - Enabled	The new selection is "1". ← Do
	"Setup. Enter Setup selection."

Press (3)

3 Redial Number

This selection lets you specify whether or not the system will immediately redial a busy number.

When Redial Number is enabled, if DiaLog Plus encounters a busy signal during the callout, it waits for the Between Calls Delay period and then redials the number. If the line is still busy, DiaLog Plus does not try any further; it automatically calls the next number on the list.

The advantage of enabling Redial Number is that DiaLog Plus has two chances to reach each person on the list. The disadvantage of enabling this feature is that time may be lost in responding to an alarm situation.

The factory setting for Redial Number is Disabled.

What you enter	*What DiaLog says*
3 (Redial Number)	"Redial Number. The present selection is Disabled. Enter new selection or press Pound (#) if OK."
0 - Disabled 1 - Enabled	"The new selection is ___1___." ← DO
	"Setup. Enter Setup selection."

STOP SKIP 4+5

PRESS (HOME) THEN 6 TO GET SYSTEM CONFIGURATION THEN 0 TO GET SYSTEM IDENTIFICATION

(GO TO PAGE 39)

SKIP

4 Printer Port

This selection lets you specify Baud Rate, Data Bits, Parity and Stop Bits for the DiaLog Plus printer port. Consult your printer manual for the communications settings required for your printer.

The factory settings are 1200 baud, 8 data bits, no parity (disabled), and 1 stop bit.

What you enter	*What DiaLog says*
4 (Printer port)	"Printer port. **Baud rate.** The present selection is 1200. Enter new selection or press Pound (#) if OK."
0 - 300 1 - 1200 (factory setting) 2 - 2400 3 - 9600	"The new selection is ____."
	"**Data Bits.** The present selection is 8 data bits. Enter new selection or press Pound (#) if OK."
0 - 7 data bits 1 - 8 data bits (factory setting)	"The new selection is _ data bits."
	"**Parity.** The present selection is Disabled. Enter new selection or press Pound (#) if OK."
0 - Disabled (factory setting) 1 - Odd 2 - Even	"The new selection is ____."
	"**Stop bits.** The present selection is 1 stop bit. Enter new selection or press Pound (#) if OK."
0 - 1 stop bit (factory setting) 1 - 2 stop bits	"The new selection is _ stop bits."
	"Setup. Enter Setup selection."

SKIP

5 Firmware version

This selection gives you the current firmware level and immediately returns you to the "Setup. Enter Setup selection" prompt.

SKIP

4 Audio Settings

Use the Audio Settings selection to turn the speaker on or off and adjust the microphone levels from a remote phone. At the front panel, you can adjust the microphone with the MIC shortcut key.

The Speaker is always On in Bypass mode, so you can always hear programming prompts and always use the system as a telephone. However, if you are using DiaLog Plus as a security monitoring system, you may want to program the speaker Off when it is in Run mode.

The microphone pickup level is factory set to 5. You may find you want to adjust it for recording messages and listening in over the telephone.

When you finish programming the microphone level, DiaLog Plus returns to the "System ready" prompt.

What you enter	*What DiaLog says*
4 (Audio Settings)	"Audio settings. **Speaker.** The present selection is On. Enter new selection or press Pound (#) if OK."
0 - Speaker OFF 1 - Speaker ON	"The new selection is ___."
	"**Microphone level.** The present level is 5. Enter new level or press Pound (#) if OK."
0 - Lowest . . . 7 - Highest	"The new level is _."
	"System ready. Enter selection."

6 System Configuration

This selection lets you set the system-wide parameters listed in Table 5.

Table 5. System Configuration

Key	*Selection*
6	SYSTEM CONFIGURATION
6 0	System Identification ▸ Identification Message ▸ Identification Number
6 1	Date and Time ▸ yy/mm/dd ▸ hh:mm:ss
6 2	Access Code
6 3	Telephone Numbers ▸ List 1-8 (or 1-4) ▸ List position 1-8 (or 1-16) ▸ Telephone number
6 4	Message Repeat
6 5	Ring Count
6 6	Delays ▸ Bypass to Run ▸ Between Calls ▸ Redial after Acknowledge
6 7	Status Notification
6 7 * 4	Global (apply to current and subsequent days) ▸ Day 1-8 ▸ Telephone List 1-8 ▸ Up to 4 notification times
6 8	Disarmed/Armed Schedule
6 8 * 4	Global (apply to current and subsequent days) ▸ Day 1-8 ▸ Disarmed time ▸ Armed time
6 9	Holiday Calendar

Global programming

With the Status Notification and Disarmed/Armed selections, you can press *4 (Global) to apply your entries not only to the selected day but also to all successive days, which speeds up and simplifies programming.

Global mode is enabled for one parameter only. For example, if you are programming Status Notification for Sunday and you press *4 (Global) at the Telephone List prompt, the List number is applied to all days of the week including holidays (Days 1-8), and then Global is disabled. If you want to apply the Notification Times to Sunday - Holiday, press Global again at the "Enter hour" prompt.

All system configuration selections are logged to the optional printer.

The following examples assume that you have pressed 6 to access System Configuration. At the "System Configuration. Enter System selection" prompt, enter one of the selections described below.

0 System Identification

This selection lets you record an 8-second identification message that is delivered every time DiaLog Plus calls out or someone calls in from a remote phone. The selection also lets you program an identification number, such as the DiaLog Plus telephone number, that is used with callouts to display pagers and on printed reports.

When the tone sounds, the microphone automatically turns on. After 8 seconds, a second tone indicates the microphone is off, and DiaLog Plus prompts "Please wait" while the message is saved. After a short interval, DiaLog plays the message back.

For the best quality messages, record them in quiet surroundings. If this is impossible at the front panel, record the messages by calling in from a remote telephone.

DiaLog's factory-programmed System Identification voice message is "This is DiaLog Plus." To restore the factory-programmed message, press RESET (*2) before the initial tone.

The factory-set identification number is 1.

What you enter	*What DiaLog says*
0 (System Identification)	**"System identification message. The present message is 'This is DiaLog Plus.' Press Pound (#) if OK, or 1 to record new message at the tone."**
1	**(Tone sounds.)**
Dictate message.	**(Tone sounds.) "Please wait."** **"The new message is DELAFIELD SANITARY LANDFILL."**
	"System identification number. The present number is 1. Enter new number or press Pound (#) if OK."
Up to 18 characters, 0-9, A-D, * and #	**"The new number is 322-7450."**
	"System configuration. Enter system selection."

PRESS ①

1 Date and Time

You must program the current date and time before you can set up valid Status Notification and Disarmed/Armed schedules or the Holiday Calendar. The date and time are shown with all events logged to the optional printer.

Program both date and time in a series of three 2-digit entries (or 1 digit plus ENTER or #).

The factory-set date is 01/01/90, and the factory time is 00:00:00. If you turn off both AC power and backup battery, the date and time revert to the factory settings.

What you enter	*What DiaLog says*
1 (Date and Time)	"System date. The present year is 90. Enter new year or press Pound (#) if OK."
2-digit year	"The new year is __."
	"The present month is 1. Enter new month or press Pound (#) if OK."
2-digit month	"The new month is __."
	"The present day is 1. Enter new day or press Pound (#) if OK."
2-digit day	"The new day is __."
	"System time. The present hour is 0. Enter new hour or press Pound (#) if OK."
2-digit hour	"The new hour is __."
	"The present minute is 0. Enter new minute or press Pound (#) if OK."
2-digit minute	"The new minute is __."
	"The present seconds are 0. Enter new seconds or press Pound (#) if OK."
2-digit seconds	"The new seconds are __."
	"System configuration. Enter system selection."

PRESS (2)

2 Access Code

Each DiaLog Plus system can be programmed with a 4-digit access code (password) to prevent unauthorized use. You must program all four digits.

For obvious security reasons, DiaLog Plus does not recite the access code and it is never shown on the printed log. However, the date and time the code is set are recorded on the optional printer.

Once you program an access code, DiaLog Plus requests the code every time you press 1 (BYPASS). You must enter all 4 digits of the code. You have two chances to enter the code correctly. After the second incorrect attempt, DiaLog Plus automatically switches out of Bypass into Run mode.

You cannot do a Memory Clear without first resetting the Access Code. The factory setting is 0000 (disabled).

What you enter	*What DiaLog says*
2 (Access Code)	"Access Code. The access code is disabled. Enter access code."
4-digit code	"The access code is enabled."
	"System configuration. Enter system selection."

USE PIN

PRESS (3)

3 Telephone Numbers

This is the only parameter that you must program in order to put DiaLog Plus into operation. As soon as you enter one or more telephone numbers in List 1, the system can take over alarm notification, using its factory programmed messages and calling parameters.

You can program up to 64 telephone numbers, either 8 lists of 8 numbers (the factory setting) or 4 lists of 16. See Telephone Lists under Setup, page 32.

Each telephone number can have up to 35 digits or special characters. The special characters are:

* 5	Radio Transmission (optional)	A	A tone/character
* 7	Pager	B	B tone/character
* 8	Dial Tone Detect	C	C tone/character
* 9	2-second Delay	D	D tone/character
* *	* tone/character		
* #	# tone/character		

Dial tone detect

Special characters can be placed anywhere in the telephone number. For example, if DiaLog Plus needs to dial 9 to get out of an internal phone system, it may also need to detect a dial tone before continuing with the number. Therefore, when you program the phone numbers, enter 9 and then *8.

For each telephone number you program, enter the List Number, the List Position, and then the Telephone Number. For each List, DiaLog will prompt for 8 telephone numbers (or 16 numbers, if you have selected the 4-list option in Setup). Press ENTER when you finish keying in a telephone number, unless you enter the maximum 35 characters. Press RESET (*2) to cancel an entry and return to the previous prompt.

A sample Telephone Number programming sequence is illustrated below. It shows ENTER (#) used twice to exit the sequence, one prompt level at a time. You can use HOME (*6) to exit to the "System ready" prompt.

The factory setting for Telephone Numbers is disabled (no entries).

What you enter	*What DiaLog says*
3 (Telephone Numbers)	"Telephone Numbers. Enter List Number.
1-8 (or 1-4)	"Telephone List 1. Enter List Position."
1-8 (or 1-16)	"Telephone List 1, Position 1. The present number is disabled. Enter new telephone number, or press Pound (#) if OK."
	↳ THEN ENTER
Up to 35 digits 0-9 or special characters	"The new number is 18003434624."
	"Telephone List 1. Enter List Position."
ENTER (#)	"Telephone Numbers. Enter List Number."
ENTER (#)	"System Configuration. Enter system selection."

PRESS (6) GO TO PAGE 46

Radio interface

If you have the optional factory-installed radio interface, you can program DiaLog to send alarm and status notification messages over a radio transmitter instead of via telephone. Simply enter *5, the Radio Transmission special character, instead of a telephone number. DiaLog repeats the messages a maximum of two times: if Message Repeats are set to 1, it speaks the messages once, and if Message Repeats are set to 2 or higher, it speaks the messages twice. It then unkeys the radio transmitter and goes into its Between Calls Delay.

If you want, you can enter Touch-Tone characters after the Radio Transmission character. Then after DiaLog Plus keys the radio transmitter, it sends the Touch-Tones before speaking its messages.

Display pager

DIALING A DISPLAY PAGER

To program DiaLog Plus to call a paging terminal, add the special pager character (*7) at the end of the paging terminal's telephone number. For example: 6172750300*7.

The *7 tells DiaLog Plus it is calling a display pager. When it makes a connection, DiaLog sends its System Identification number and the number(s) of the channel in alarm, in Touch-Tone form, instead of a voice message. The numbers are sent just once; the Message Repeat parameter is not applicable.

Some paging terminals answer with a spoken message instead of the usual three beeps. In this case, you need to time the message and then insert the appropriate number of 2-second delay characters (*9) after the pager character at the end of the terminal phone number. For example, if the paging terminal has a 6-second message, enter: 6172750300*7*9*9*9.

The person who receives the notification on a pager can acknowledge the alarm with a phone call, if you enable Call In Acknowledge. To allow time for the recipient to get to a telephone, you may need to program a Between Calls Delay of 2 minutes or more.

4 Message Repeats

SKIP

When DiaLog Plus makes an alarm callout, it speaks its System Identification message, the messages for any channels in alarm and then says, "Please acknowledge." This selection lets you determine the number of times DiaLog Plus repeats the message sequence. You can enter a number from 1 to 20.

Each time DiaLog Plus speaks the message sequence, it requests an acknowledgement. As soon as acknowledgement is received, the message repeat is cancelled.

The factory setting is 3 repeats.

What you enter	*What DiaLog says*
4 (Message Repeats)	"Message repeats. The present value is 3. Enter new value or press Pound (#) if OK."
1-20 (two digits or one digit plus ENTER)	"The new value is __."
	"System configuration. Enter system selection."

5 Ring Count

SKIP

This selection lets you specify the number of times an incoming call must ring before DiaLog Plus answers. The ring count is important if the system is sharing the line with a standard telephone, and you want to give someone time to answer before DiaLog picks up the call. You can enter a number from 1 to 20.

If there is an unacknowledged alarm, DiaLog Plus will always answer a call after 2 rings, no matter what the ring count is, to avoid delay in acknowledging an alarm.

The factory setting is 2 rings.

What you enter	*What DiaLog says*
5 (Ring Count)	"Ring Count. The present value is 2. Enter new value or press Pound (#) if OK."
1-20 (two digits or one digit plus ENTER)	"The new value is __."
	"System configuration. Enter system selection."

6 Delays

This selection lets you specify the length of three delay periods: Bypass to Run, Between Calls, and Redial After Acknowledge.

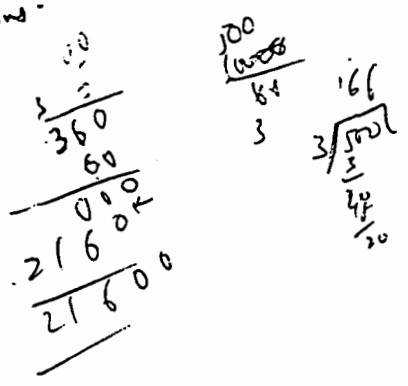
The *Bypass to Run Delay* is the amount of time that must elapse before DiaLog Plus automatically goes from Bypass mode to Run mode. Suppose the Bypass to Run delay is 60 minutes. This means that if you forget to press 2 (Run) after you program the system, it automatically switches into Run mode after one hour and begins its alarm monitoring and notification tasks. You can specify a Bypass to Run Delay of 0-999 minutes. 0 disables automatic switchover, which means you must put the system into Run mode manually.

The *Between Calls Delay* is the amount of time between the system's alarm callouts. This delay gives a busy line a chance to become free, so that if you have enabled Redial Number, DiaLog may be able to reach a busy number on the second try. Also, the Between Calls Delay provides time for someone to phone in an alarm acknowledgement, if you have enabled Call In Acknowledge. You can specify a Between Calls Delay of 10 to 9999 seconds.

The *Redial after Acknowledge Delay* is the amount of time Dialog waits, after receiving acknowledgement of an alarm, for the alarm condition to clear before it restarts the notification process. You can specify a delay of 1 to 9999 minutes.

The factory settings for the delays are:

Bypass to Run	- 60 minutes
Between Calls	- 30 seconds
Redial after Acknowledge	- 60 minutes



What you enter	*What DiaLog says*
6 (Delays)	"System delays. **Bypass to Run Delay.** The present value is 60 minutes. Enter new value or press Pound (#) if OK."
Three digits, 000-999 (or one or two digits plus ENTER)	"The new value is 030 minutes."
	"**Between Calls Delay.** The present value is 30 seconds. Enter new value or press Pound (#) if OK."
Four digits, 0010-9999 (or two to three digits plus ENTER)	"The new value is 0060 seconds."
	"**Redial after Acknowledge Delay.** The present value is 60 minutes. Enter new value or press Pound (#) if OK."
Four digits, 0001-9999 (or one to three digits plus ENTER)	"The new value is ____ minutes."
	"System configuration. Enter system selection." PRESS (HOME) THEN 9 TO GET CHANNEL CONFIGURATION GO TO PAGE 54

7 Status Notification Schedule SKIP BECAUSE I COULD NOT ALWAYS ACKNOWLEDGE

You can program DiaLog Plus to make scheduled callouts up to 4 times a day, 7 days a week plus holidays, with a status report. Different telephone lists can be assigned to each day. You might want to use this feature just to get daily assurance that the telephone line to a site is in working order. A status notification call must be acknowledged.

Before the system makes a status call, it checks all input channels. If any unacknowledged alarms exist, DiaLog Plus skips the status notification procedure so it can carry out its primary task of alarm notification.

When it is time for a status callout, DiaLog Plus dials the designated telephone number(s), delivers the system identification message, current date and time, mode (Run or Bypass), Armed/Disarmed status, power fail message if applicable, the channels in alarm, low battery or bad battery message if applicable, and Program Holiday Calendar message if applicable. It then says "Please acknowledge," and waits 4 seconds for a * or 8 (ACKNOWLEDGE) signal.

If the system receives an ACKNOWLEDGE signal, it says "Status notification acknowledged," waits an additional 4 seconds for keystrokes, then says "Bye" and hangs up. During the final 4-second delay, the person receiving the call can press # (ENTER) and then enter a programming selection. If DiaLog Plus does not receive an ACKNOWLEDGE signal, it repeats the message sequence (see Message Repeats) before moving on to the next number on the telephone list.

To program the Status Notification Schedule, select the day of the week (1-8, Sunday through Holiday). Then assign a Telephone List (1-8) and up to four notification times. For each notification time, you enter a 2-digit hour in 24-hour format and a 2-digit minute. (You can cancel an entry by pressing # instead of entering a minute.) If the system is set up for 12-hour clock format, DiaLog translates 24-hour time into A.M. and P.M. when it confirms the entry. For example, it confirms 15 hours, 30 minutes as "3 hours, 30 minutes, P.M."

Using the Global command

To assign the same Telephone List to the selected day and all subsequent days, press *4 (Global) at the "Enter list number" prompt. DiaLog Plus confirms the keystroke with "Global Enabled." Global is automatically disabled as soon as the Telephone List is programmed.

To program the same notification time for the selected day and all subsequent days, press *4 (Global) at the "Enter hour" prompt. After you enter the minute, DiaLog Plus speaks the time and confirms the days of the week that are programmed, for example, "8 hours, 30 minutes, A.M. added. Friday added; Saturday added; Holiday added." Global remains enabled until all four notification times are programmed or you disable it by pressing *4 again, ENTER (#), RESET (*2) or HOME (*6).

Deleting a time

To delete a time from the Status Notification schedule, just re-enter it. For example, if you wanted to delete 8:00 A.M. from the sample schedule on the next page, at the second "Enter hour" prompt, you would re-enter 8 hours, then 0 minutes. DiaLog Plus would confirm "8 hours, 0 minutes deleted." Since Global is still enabled, DiaLog Plus would say, "Monday deleted; Tuesday deleted; Wednesday deleted; Thursday deleted; Friday deleted; Saturday deleted; Holiday deleted."

To clear all the notification times from a schedule, press RESET (*2) at the "Enter hour" prompt.

A sample Status Notification programming sequence is shown on the next page. We have assigned List 1 to every day of the week, including holidays, and programmed one daily notification time, 8:00 A.M. At the end, we use ENTER (#) twice to exit to the "Enter system selection" prompt.

The factory setting for Status Notification is disabled (no callouts).

What you enter	*What DiaLog says*
7 (Status Notification)	"Status Notification Schedule. **Enter day** or press Pound (#) if OK.
One digit 1-8 (Sunday - Holiday)	Sunday Telephone List. The present list is disabled. **Enter list number** or press Pound (#) if OK."
*4	"Global enabled."
One digit 1-8 (or 1-4, if you selected 4 lists)	"The new List is 1."
	"Global disabled."
	"**Sunday Status Notification Schedule.** No entry. **Enter hour** or press Pound (#) if OK."
*4	"Global enabled."
08 (or 8 #)	"The new hour is 8."
	"**Enter minute** or press Pound (#) if OK."
00 (or 0 #)	"The new minute is 0. 8 hours, 0 minutes, A.M. added. Monday added; Tuesday added, Wednesday added; Thursday added; Friday added; Saturday added; Holiday added."
	"Sunday Status Notification Schedule. **Enter hour** or press Pound (#) if OK."
*4	"Global disabled."
ENTER (#)	"Status Notification Schedule. **Enter day** or press Pound (#) if OK."
ENTER (#)	"System configuration. Enter system selection."

SEPARATE WEEKEND/HOLIDAY NOTIFICATION SCHEDULE

To program one schedule for weekdays and a different schedule for weekends and holidays, follow these steps:

- Select Monday (Day 2), turn on Global at the Monday "Enter list number" prompt, and enter the weekday Telephone List. This programs the same list to Monday-Holiday (Days 2-8).
- Turn on Global at the first "Enter hour" prompt. This will program the same notification times to Monday-Holiday (Days 2-8). Turn off Global after your final time entry.
- Select Saturday (Day 7), turn on Global at the Saturday "Enter list number" prompts, and enter the weekend Telephone List. This programs the same list to Saturdays and Holidays (Days 7-8).
- Turn on Global at the first "Enter hour" prompt. This programs the same notification times to Saturday-Holiday (Days 7-8). Turn off Global after your final time entry.
- Select Sunday (Day 1). Do not turn on Global, but assign the same Telephone List and notification times that you assigned to Saturdays and Holidays.

8 Disarmed/Armed Schedule SKIP

As it is shipped from the factory, DiaLog Plus monitors its AC power line and input channels continuously, and makes notification calls whenever an alarm is detected. However, you can disarm the system (disable alarm callouts) during hours when employees are at the site, for instance, from 8:00 A.M. to 5:00 P.M. on weekdays.

For example, to disarm the system during working hours on weekdays, you program a Disarmed Time of 08:00 and an Armed Time of 17:00 for Monday through Friday. Disable both the Disarmed Time and Armed Time for Saturday, Sunday and holidays, which leaves the system always armed.

Be careful not to leave DiaLog Plus disarmed.

IMPORTANT: If you enter a Disarmed Time, you must also enter an Armed Time or you may permanently disarm the system.

A Disarmed or Armed status carries over from one day to another until DiaLog Plus encounters a different status. For instance, suppose you are operating on the above schedule, where DiaLog Plus is disarmed at 8:00 A.M. and armed at 5:00 P.M. Monday-Friday. If you disable the Wednesday Armed Time, DiaLog Plus will not make any alarm notification calls until it encounters the Thursday Armed Time at 5:00 P.M.

If you disarm the system and do not re-arm it, DiaLog Plus warns "No Armed Time in schedule" before you exit the Disarmed/Armed Schedule and when the system enters Run mode. "No Armed Time in Schedule" is also included

in the System Status report. A message is logged to the optional printer whenever the system is disarmed or armed.

The Disarmed/Armed schedule does not affect Status Notification.

To program, select the day of the week (1-8, Sunday through Holiday). Then enter a 2-digit hour (in 24-hour time format) and a 2-digit minute at the Disarmed Time and Armed Time prompts. (You can cancel an entry by pressing # instead of entering a minute.) If you selected a 12-hour clock format in Setup, DiaLog converts the hour to 12-hour time and adds "A.M." or "P.M." when it confirms your entries.

To accept the present Disarmed or Armed time, press ENTER (#) at the "Enter hour" prompts.

To delete a time from the schedule, re-enter it.

To program the same Disarmed and Armed Times for the selected day and all subsequent days, press *4 (Global) at the Disarmed Time "Enter hour" prompt. DiaLog Plus confirms the selection with "Global Enabled." Global is automatically disabled as soon as the Armed Time minutes are entered.

A typical Disarmed/Armed Schedule programming sequence is shown below. The schedule disarms DiaLog Plus Monday-Friday from 8:00 A.M. to 5:00 P.M. and arms it every night, and on weekends and holidays. Starting with Monday, we programmed a global Disarmed Time and Armed Time of 8:00 A.M. and 5:00 P.M. The Global command programmed Monday-Holiday. Next, we armed Saturday and Holiday by globally disabling both the Disarmed and Armed Times. Finally, we armed Sunday by accepting the factory settings (Disarmed and Armed Times both disabled).

What you enter	*What DiaLog says*
8 (Disarmed/Armed Schedule)	"Disarmed/Armed Schedule. **Enter day** or press Pound (#) if OK."
2 (Monday)	**Monday Disarmed Time.** The present selection is disabled. **Enter hour** or press Pound (#) if OK."
*4	"Global enabled."
08 (or 8 #)	"The new hour is 8. **Enter minute** or press Pound if OK."
00 (or 0 #)	"The new selection is 8 hours, 0 minutes, A.M.

What you enter	*What DiaLog says*
	"**Monday Armed Time.** The present selection is disabled. **Enter hour** or press Pound (#) if OK."
17	"The new hour is 17. **Enter minute** or press Pound (#) if OK."
00	"The new selection is 5 hours, 0 minutes P.M."
	"Global disabled."
	"**Disarmed/Armed Schedule. Enter day** or press Pound (#) if OK."
7 (Saturday)	"**Saturday Disarmed Time.** The present selection is 8 hours, 0 minutes A.M. **Enter hour** or press Pound (#) if OK."
*4	"Global enabled."
*2	"The new selection is disabled.
	"**Saturday Armed Time.** The present selection is 5 hours, 0 minutes P.M. **Enter hour** or press Pound (#) if OK."
*2	"The new selection is disabled."
	"Global disabled."
	Disarmed/Armed Schedule. Enter day or press Pound if OK."
1 (Sunday)	"**Sunday Disarmed Time.** The present selection is disabled. **Enter hour** or press Pound (#) if OK."
#	"**Sunday Armed Time.** The present selection is disabled. **Enter hour** or press Pound (#) if OK."
#	"**Disarmed/Armed Schedule. Enter day** or press Pound (#) if OK."
#	"System Configuration. Enter system selection."

9 Holiday Calendar

SKIP

This selection lets you assign Holiday status to up to 20 days in the year. DiaLog Plus then treats these days as holidays for the purposes of Status Notification and the Disarmed/Armed schedule.

The dates you choose are entirely up to you, which means that DiaLog Plus can accommodate traditional holidays in a number of different countries, as well as individual plant shutdowns or vacation schedules.

The Holiday Calendar has a 13-month cycle, so during the month of January you can program holidays for January of the present year (as long as the day has not passed) and January of the coming year. This gives you a one-month grace period every year in which to re-enter holidays. Every January, DiaLog Plus delivers a "Program holiday calendar" message with the other system status messages. The reminder is repeated either until you select the Holiday Calendar parameter (with or without reprogramming the holidays) or until January 31 passes.

You can add holidays to the calendar at any time, as long as the holiday is still in the future, and the calendar is not full. For example, in April you can add October 12 to the Holiday Calendar, but you cannot add February 22 because that date has passed. On July 1, you can add holidays in July through the following January (months 7-13).

For each holiday, enter a 2-digit month and a 2-digit day. After each entry, DiaLog prompts, "[Month, day] added." You do not have to enter the dates in chronological order; DiaLog Plus automatically sorts them for you.

If the maximum number of dates has been programmed, DiaLog Plus prompts "Calendar is full. [Month, day] not added" and reverts to the "Enter month" prompt.

To delete a holiday, re-enter it. DiaLog prompts "[Month, day] deleted."

To exit the Holiday Calendar selection, press ENTER (#) at an "Enter month" prompt. RESET (*2) deletes all entries and returns you to the "Holiday Calendar" prompt. HOME (*6) deletes all entries and returns you to the "System ready" prompt.

The following example shows how to program July 4, Christmas and New Year's Day of the following year into the Holiday Calendar.

What you enter	*What DiaLog says*
9 (Holiday Calendar)	"Holiday Calendar. No entry. **Enter month** or press Pound (#) if OK."
07	"The new month is 7. **Enter day** or press Pound (#) if OK."
04	"The new day is 4. July 4 added.
	"Holiday calendar. **Enter month** or press Pound (#) if OK."
12	"The new month is 12. **Enter day** or press Pound (#) if OK."
25	"The new day is 25. December 25 added."
	"Holiday calendar. **Enter month** or press Pound (#) if OK."
13	"The new month is 13. **Enter day** or press Pound (#) if OK."
01	"The new day is 1. Next January 1 added."
	"Holiday Calendar. **Enter month** or press Pound (#) if OK."
#	"System configuration. Enter system selection."

To check the Holiday Calendar, follow this sequence:

What you enter	*What DiaLog says*
9 (Holiday Calendar)	"Holiday Calendar. The present calendar is July 4, December 25, next January 1. **Enter month** or press Pound (#) if OK."
ENTER (#)	"System configuration. Enter system selection."

9 Channel Configuration

This selection lets you set parameters that apply to individual channels. Table 6 summarizes these parameters.

Table 6. Channel Configuration

Key	*Selection*
9	CHANNEL CONFIGURATION
	▸ **Channel number 0-8**
DO NOT USE * 4	Global (apply entry to selected and successive channels. You can enter this command *after* each channel selection listed below.)
0	Channel State
1	Channel Messages
2	Channel Mode
3	Telephone List 1-8 (or 1-4)
4	Alarm Delay, 1-999 seconds
5	▸ Totalizer limit 0-32767 ▸ Duration limit 0-9999 minutes
6	▸ Totalizer reset, 0-32767 ▸ Duration reset, 0-9999 minutes

Selecting a channel

When you press 9 (Channel Configuration), DiaLog Plus confirms the selection and then prompts for a channel number. Enter a channel number, and DiaLog confirms your entry, adding "Digital Input" for Channels 1-8 or "Power Failure" for Channel 0. The channel remains selected from one channel parameter to another, so you can program several parameters without having to re-enter the channel number. In other words, after you complete a programming sequence, DiaLog Plus returns to the "Channel *n*. Enter channel selection" prompt.

Deselecting a channel

Press RESET (*2) to deselect the channel and return to the "Channel Configuration. Enter channel number" prompt.

Using the Global command

After you enter a channel number and a channel selection, you can press *4 (Global) to apply the entry not only to the selected channel but also to all successive channels. For example, if you select Channel 2, then Channel State, and press *4 (Global), the state you select for Channel 2 (Normally Open or Normally Closed) will also be applied to Channels 3 - 8. Global mode is enabled for one channel parameter only. Using the previous example, Global is automatically disabled as soon as you enter 0 or 1 to select the Channel State.

To disable Global during an entry, press *4 again. DiaLog Plus responds, "Global disabled." You can also disable Global with ENTER, RESET or HOME.

The following examples assume that you have already pressed 9 to access Channel Configuration, and at the "Channel Configuration. Enter channel number" prompt, you have pressed 1 to select Channel 1.

0 Channel State

This selection lets you specify the normal state of the contact at a Digital Input channel: Normally Open or Normally Closed. You cannot change the normal state of the contact at the Power Fail channel (Channel 0), which is fixed as Normally Open.

The factory setting for all channels is Normally Open.

In the entry sequence below, *4 (Global) is used to apply the same state to Channels 1-8.

What you enter	*What DiaLog says*
0 (Channel State)	"Channel state. The present selection is Normally Open. Enter new selection or press Pound (#) if OK."
*4	"Global enabled."
0 = Normally Open 1 = Normally Closed	"The new selection is _____."
	"Global disabled."
	"Channel 1, Digital Input. Enter channel selection."

1 Channel Messages

This selection lets you record an 8-second Alarm or On message for each digital input channel or two 4-second messages, one for the Normal or Off condition and one for the Alarm or On condition. (You cannot record messages for Channel 0, Power Failure. The factory-programmed Channel 0 alarm message is "System on battery backup." The factory-programmed normal message is "Power normal.")

The factory-programmed messages are designed to serve digital input channels set for Call On Alarm mode, Status Only mode or Call on Limit mode (see Channel Mode). The alarm messages, both 8-second and 4-second, for Channels 1-8 are "Channel *n* is in Alarm" or "Channel *n* is On." The 4-second normal message is "Channel *n* is Normal" or "Channel *n* is Off."

To record a new message, first select whether you want one 8-second message or two 4-second messages. If you select the two-message option, DiaLog Plus prompts first for the normal message and then for the alarm message.

When the tone sounds, speak clearly about 6" from the microphone. The tone sounds again after 4 or 8 seconds, indicating the end of the recording interval. DiaLog plays your message back. If you are dissatisfied, you can re-record the message. *4 (Global) is not valid when you record a message.

The following sequences show you how to program both one 8-second message and two 4-second messages. A pointer indicates our selections.

8-second alarm message

What you enter	*What DiaLog says*
1 (Channel Messages)	"Channel Messages. The present selection is two 4-second messages. Enter new selection or press Pound (#) if OK."
0 - One 8-second message 1 - Two 4-second messages	"The new selection is one 8-second message."
	"8-second Alarm or On Message. The present message is 'Channel 1, Digital Input, is in Alarm.' Press Pound (#) if OK or 1 to record new message at the tone."
1	(Tone sounds.)
Speak message.	(Tone sounds.) "Please wait."
	"The new message is _____."
	"Channel 1, Digital Input. Enter channel selection."

Two 4-second messages

What you enter	*What DiaLog says*
1 (Channel Messages)	"Channel Messages. The present selection is one 8-second message. Enter new selection or press Pound (#) if OK."
0 - One 8-second message 1 - Two 4-second messages	"The new selection is two 4-second messages."
	"4-second Normal or Off Message. The present message is 'Channel 1, Digital Input, is Normal.' Press Pound (#) if OK or 1 to record new message at the tone."
1	(Tone sounds.)
Speak message.	(Tone sounds.) "Please wait."
	"The new message is _____."
	"4-second Alarm or On message. The present message is 'Channel 1, Digital Input, is in Alarm.' Press Pound (#) if OK or 1 to record new message at the tone."
1	(Tone sounds.)
Speak message.	(Tone sounds.) "Please wait."
	"The new message is _____."
	"Channel 1, Digital Input. Enter channel selection."

2 Channel Mode

This selection lets you specify if and when a channel makes alarm notification calls. The channel mode determines the content of the alarm and status messages.

- You can *Disable* a channel, which means that the channel does not go into alarm and is not included in a Status Notification call. For example, you may want to disable a channel that is monitoring equipment currently under repair, or a channel that is currently unused. The only way to get information on a disabled channel is through a System Status request. The status message is "Channel *n*, Digital Input, is disabled." You cannot modify this message.

- You can designate a channel as *Status Only*, which means that the channel does not initiate an alarm callout (and does not cause the alarm LED to light when it changes state) but can be included in a Status report. For example, you can select Status Only mode for a channel monitoring the On/Off status of a pump, because while you want to be able to find out the status, you don't want DiaLog to make an alarm call every time the pump goes on. To check the status, press 0 (System Status), then at the prompt enter the channel number or ** for all channels. The factory-programmed On message is "Channel *n*, Digital Input, is On." The factory-programmed Off message is "Channel *n*, Digital Input, is Off." You can record an alternative 8-second On message, or two 4-second messages, one for the Off condition and one for On.

- You can accept the factory-set mode, *Call on Alarm*, where DiaLog automatically makes alarm notification calls when the channel goes into alarm. Before calling out, DiaLog Plus waits for the Alarm Delay to time out, ensuring that the channel is in fact in alarm, not just reflecting a power surge, for instance. (The factory-set Alarm Delay is 3 seconds, but you can program a delay of from 1-999 seconds. See below.) The factory-programmed messages are "Channel *n*, Digital Input, is in Alarm" and "Channel *n*, Digital Input, is Normal." You can program alternative messages.

  If the channel is programmed as Call on Alarm, you specify whether or not the system continues to call even if the alarm clears. The factory setting is Disabled (DiaLog does not continue to call).

- You can program a channel as *Call on Limit*, which means that DiaLog calls when one of the channel's counter limits is reached. Each channel has two counters associated with it: a Totalizer and a Duration Counter. The Totalizer counts the number of times the channel goes from normal to off-normal state, while the Duration counter keeps track of how long the channel stays in off-normal state. The factory-programmed alarm message is "Channel *n*, Digital Input, is in alarm." You can program a different message. If the Totalizer limit is reached, after speaking the alarm message DiaLog says, "Totalizer alarm. The present Totalizer count is _____." If the Duration Counter limit is reached, DiaLog says, "Duration alarm. The present Duration count is __ hours, __ minutes, __ seconds."

The following sequence programs Channel 1, which in this example is currently disabled, as Call on Alarm, and tells DiaLog to continue calling after the channel returns to normal.

What you enter	*What DiaLog says*
2 (Channel Mode)	"**Channel Mode.** The present selection is Disabled. Enter new selection or press Pound (#) if OK."
0 - Disabled 1 - Status Only 2 - Call on Alarm ☎ 3 - Call on Limit	"The new selection is Call on Alarm."
	"**Continue alarm notification if return to normal.** The present selection is Disabled. Enter new selection or press Pound (#) if OK."
0 - Disabled 1 - Enabled ☎	"The new selection is Enabled."
	"Channel 1, Digital Input. Enter channel selection."

3 Telephone List

This selection lets you assign a telephone list 1-8 (or 1-4, if you specified 4 lists in Setup) to a channel. The channel's alarm priority is determined by the telephone list. List 1 has the highest priority, with priority going down as the list number goes up. The following sequence assigns List 2 to Channels 1-8.

The factory setting for all channels is List 1.

What you enter	*What DiaLog says*
3 (Telephone List)	"Telephone List. The present list is 1. Enter list number."
*4	"Global enabled."
2	"The new list is 2."
	"Global disabled."
	"Channel 1, Digital Input. Enter channel selection."

4 Alarm Delay

This selection lets you specify an Alarm Delay of 1-999 seconds for each channel. The Alarm Delay is the period of time that the channel must be in an alarm condition before DiaLog Plus starts the callout process. This time delay helps ensure that the channel is in fact in alarm, not merely reflecting a power surge or vibrating relay.

The factory setting for the Alarm Delay is 3 seconds.

What you enter	*What DiaLog says*
4	"Alarm Delay. The present value is 3 seconds. Enter new value or press Pound (#) if OK."
3 digits 001-999 (or one or two digits plus ENTER)	"The new value is ___ seconds."
	"Channel 1, Digital Input. Enter channel selection."

5 Limits

There are two counters associated with each DiaLog Plus channel: a Totalizer and a Duration counter. The Totalizer keeps track of the number of times a channel goes from normal to off-normal state (for example, Off to On or Open to Closed). The Duration counter keeps track of the number of minutes a channel is in off-normal state.

Use the Limits selection to enter limits for the Totalizer and the Duration counter. When one of these limits is reached, it triggers an alarm callout if the channel is programmed to Call on Limit (see Channel Mode). You can set a Totalizer limit from 0-32767, and a Duration Counter limit from 0-9999 minutes. If the limits are 0, DiaLog does not call out.

*4 (Global) applies to one limit at a time. For example, if you press *4 at the "Totalizer limit" prompt, only the Totalizer limit value is applied to the selected and successive channels. You must press *4 again at the "Duration limit" prompt to apply a Duration limit value to the present and successive channels.

(If there is a power loss *and* the battery has failed, the counters are reset to 0.)

The factory setting for Totalizer limit is 32767, and for the Duration Counter, 120 minutes.

What you enter	*What DiaLog says*
5 (Limits)	"Limits. **Totalizer limit.** The present value is 32767. Enter new value or press Pound (#) if OK."
Five digits 00001-32767 (or one to four digits plus ENTER)	"The new value is _____ ."
	"**Duration limit.** The present value is 120 minutes. Enter new value or press Pound (#) if OK."
Four digits 0001-9999 (or one to three digits plus ENTER)	"The new value is ____ minutes."
	"Channel 1, Digital Input. Enter channel selection."

6 Resets

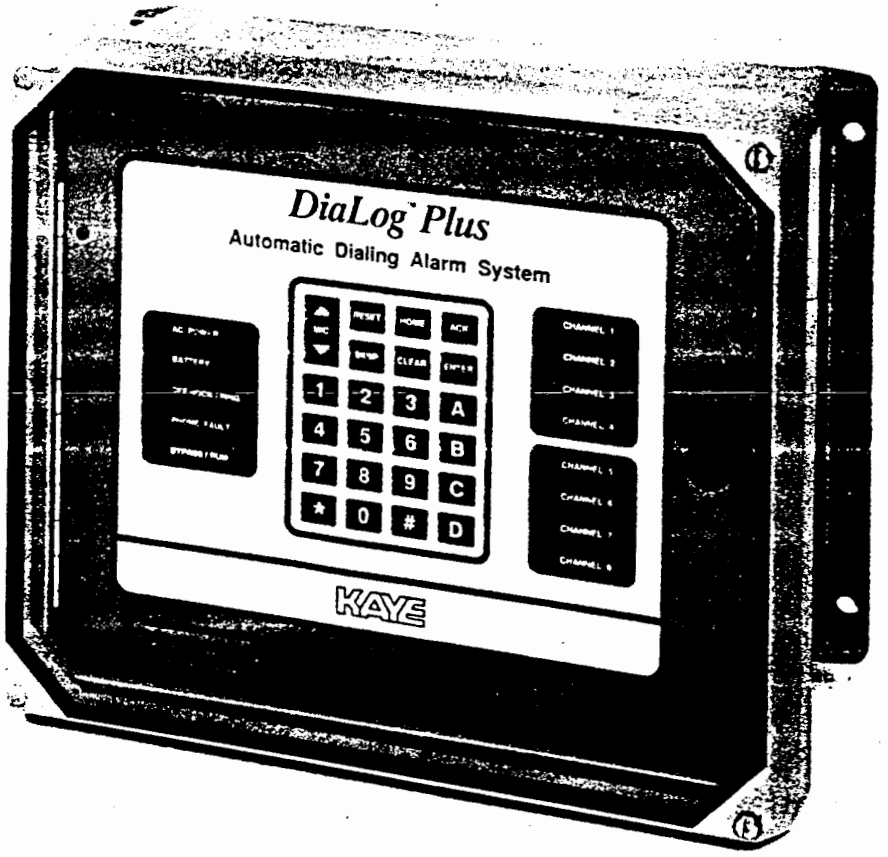
This selection is actually a runtime operation, not a programming parameter. The Totalizer and Duration counters automatically reset to zero when they reach their maximum values, 32767 for the Totalizer and 9999 for the Duration counter. (The counters do not reset when they reach the limits you have programmed.)

You can use this selection to do an immediate reset of the counters, either to zero or, if you need an offset for your starting point, to another value.

*4 (Global) applies to one reset at a time. For example, if you enter *4 at the "Totalizer reset" prompt, only the Totalizer reset value is applied to the selected and successive channels. You must enter *4 again at the "Duration reset" prompt to apply a Duration reset value to the selected and successive channels.

The following sequence resets the Totalizer and Duration counters for Channels 1-8 to zero.

What you enter	*What DiaLog says*
6 (Resets)	"Resets. **Totalizer Reset.** The present value is _____. Enter new value or press Pound (#) if OK."
*4 (Global)	"Global enabled."
0, #	"The new value is zero."
	"Global disabled."
	"**Duration reset.** The present value is ___ minutes. Enter new value or press Pound (#) if OK."
*4 (Global)	"Global enabled."
0, #	"The new value is zero minutes."
	"Global disabled."
	"Channel 1, Digital Input. Enter channel selection."


DiaLog Plus
Automatic Dialing Alarm System
KAYE

Programming Forms

These forms will help you plan the program, and because they follow the verbal prompts, step-by-step, they should make it easier to enter your selections.

We suggest that you make copies of the forms and fill them out before you begin programming the DiaLog Plus. You will need to make multiple copies of the Channel Programming form, one for each input channel and power failure.

Use the last form, the Telephone Directory sheet, to list the telephone numbers you will be entering during system configuration. Depending on the number of telephone lists you select, you may have 8 lists of 8 telephone numbers or 4 lists of 16 numbers.

Setup

Factory Settings

0 Date/Time Format __ 0-4 — *0 (mm/dd/yy hh:mm:ss)*

0 = mm/dd/yy hh:mm:ss
1 = yy-mm-dd hh:mm:ss
2 = dd.mm.yy hh.mm.ss
3 = dd/mm/yy hh:mm:ss
4 = dd mm yy hh:mm:ss

Clock Format __ 0-1 (0 = 24-hour, 1 = 12-hour) — *0 (24-hour)*

1 Telephone Lists __ 0-1 (0 = 8 lists of 8, 1 = 4 lists of 16) — *0 (8 lists of 8)*

2 Call In Acknowledge __ 0-1 (0 = disabled, 1 = enabled) — *0 (disabled)*

3 Redial Number __ 0-1 (0 = disabled, 1 = enabled) — *0 (disabled)*

4 Printer Port

Baud rate __ 0-3 (0 = 300, 1 = 1200, 2 = 2400, 3 = 9600) — *1 (1200 baud)*
Data bits __ 0-1 (0 = 7 bits, 1 = 8 bits) — *1 (8 data bits)*
Parity __ 0-2 (0 = Disabled, 1 = Odd, 2 = Even) — *0 (disabled)*
Stop bits __ 0-1 (0 = 1 bit, 1 = 2 bits) — *0 (1 stop bit)*

System Configuration

Factory Settings

0 System identification

8-second voice message _____ — *"This is DiaLog Plus."*

_____

18-character ID _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ — *1*

1 Date and Time

Date __ __ / __ __ / __ __ yy/mm/dd — *90/01/01*
Time __ __ / __ __ / __ __ hh:mm:ss — *00:00:00*

2 Access Code _ _ _ _ — *0000*

System Configuration *continued*

	Factory Settings
3 Telephone Numbers	*Disabled*
List __ 1-8 (or 1-4) Position __ 1-8 (or 1-16)	
Enter number (up to 35 characters). See telephone directory sheet.	
__ __	
__ __ __ __ __ __ __ __ __ __ __ __ __	
4 Message Repeat __ __ 1-20	*3*
5 Ring Count __ __ 1-20	*2*
6 Delays	
Bypass to Run __ __ __ 0-999 minutes	*60 minutes*
Between Calls __ __ __ __ 10-9999 seconds	*30 seconds*
Redial After Acknowledge __ __ __ __ 1-9999 minutes	*60 minutes*
Status Notification (hh/mm)	*No entries*
Telephone list __ 1-8	
Notification times __ __/__ __, __ __/__ __, __ __/__ __, __ __/__ __	
8 Disarmed/Armed Schedule (hh/mm)	*Disabled (always armed)*

	Disarmed	Armed
Sunday	__ __/__ __	__ __/__ __
Monday	__ __/__ __	__ __/__ __
Tuesday	__ __/__ __	__ __/__ __
Wednesday	__ __/__ __	__ __/__ __
Thursday	__ __/__ __	__ __/__ __
Friday	__ __/__ __	__ __/__ __
Saturday	__ __/__ __	__ __/__ __
Holiday	__ __/__ __	__ __/__ __

9 Holiday Calendar (mm/dd) — *No entries*

__ __/__ __	__ __/__ __	__ __/__ __	__ __/__ __
__ __/__ __	__ __/__ __	__ __/__ __	__ __/__ __
__ __/__ __	__ __/__ __	__ __/__ __	__ __/__ __
__ __/__ __	__ __/__ __	__ __/__ __	__ __/__ __
__ __/__ __	__ __/__ __	__ __/__ __	__ __/__ __

9 Channel Configuration

Factory Settings

Enter channel number __ (0-8)

0 Channel State __ 0-1 (0=normally open, 1=normally closed) — *0 (normally open)*

1 Channel Messages __ 0-1 — *0*

0 = One 8-second alarm/on message _____ — *"Channel n is in alarm."*

_____

1 = Two 4-second messages

Alarm/On message _____

Normal/off message _____

2 Channel Mode __ 0-3 — *2 (Call on alarm)*

0 = Disabled
1 = Status Only (never call out)
2 = Call on Alarm
Continue notification if normal __ 0-1 — *0 (Disabled)*
0 = Disabled
1 = Enabled
3 = Call on Limit

3 Telephone List __ 1-8 (or 1-4) — *1 (highest priority)*

4 Alarm Delay ___ 1-999 seconds — *3 seconds*

5 Limits

Totalizer limit _____ 1-32767 (0 to disable) — *32767*

Duration limit _____ 1-9999 minutes (0 to disable) — *120 minutes*

6 Resets

You reset the totalizer and duration counters manually by entering a reset value at the keypad or from a remote telephone. The range of entries is 0-32767 for the totalizer counter and 0-9999 minutes for the duration counter.

Telephone Directory

List 1
1.
2
3
4
5
6
7
8
List 2
1
2
3
4
5
6
7
8
List 3
1
2
3
4
5
6
7
8
List 4
1
2
3
4
5
6
7
8

List 5
1.
2.
3
4.
5.
6.
7.
8.
List 6
1.
2
3
4
5
6
7
8
List 7
1
2
3
4
5
6
7
8
List 8
1
2
3
4
5
6
7
8

List 1
1.
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

List 2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

List 3
1.
2.
3
4.
5.
6.
7.
8.
9
10
11
12
13
14
15
16

List 4
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

6. Using DiaLog Plus

This section of the User's Guide describes the day-to-day operation of DiaLog Plus. It tells you how to:

- acknowledge an alarm
- cancel an alarm callout
- request a status report
- switch between Run and Bypass modes
- use DiaLog as a speaker phone
- call in and listen to sounds near the unit
- print a report of programming parameters
- reset channel totalizer and duration counters

Table 7. DiaLog Plus Operating Keystrokes

Front Panel	*Selection*	*Remote*
ACK	Acknowledge alarms	* or 8
HOME	Cancel alarm callouts	

Key	*Selection*
0	System Status
	n Single channel
	* * All channels
1	Bypass mode
2	Run mode
5	Call Out/Listen In
8	Print Configuration Report
9	Channel Configuration
	6 Reset Counters

Acknowledge

[*] or [8]

From a remote telephone

At a remote telephone, when you receive an alarm notification call, DiaLog delivers the message, says "Please acknowledge," and waits 4 seconds for you to enter * or 8 (Acknowledge). *Note: wait until DiaLog has finished speaking to acknowledge the call.* If DiaLog doesn't receive an Acknowledge signal, it repeats "Please acknowledge" and waits another 4 seconds. It repeats this message sequence and then hangs up and waits for a return call.

If DiaLog receives an Acknowledge signal, it says "Alarms acknowledged," beeps three times and waits 4 seconds for you to press ENTER to begin programming. Your * or 8 signal acknowledges only the alarm message(s) you received. On the other hand, if Call In Acknowledge is enabled, a return call during the Between Calls Delay acknowledges all alarms in the system.

[ACK]

At the front panel

At the front panel, press ACK to acknowledge a channel in alarm. The red channel indicator goes from blinking (unacknowledged alarm) to steady On (alarm acknowledged but not cleared). If more than one channel is in alarm, ACK acknowledges them all simultaneously.

Alarm logging

If you have a printer attached, the log says "Channel *n* alarm acknowledged," "Alarm(s) acknowledged by Call In," or "Alarm(s) acknowledged local." When an alarm condition clears, the log says, "Channel *n* alarm cleared."

[HOME] Cancel Alarm Callouts

At the front panel, press HOME to terminate a call in progress and return the system to on hook status.

[0] System Status

From a remote telephone

At a remote telephone, when you dial DiaLog's number you automatically get an abbreviated System Status report, which includes:

- voice ID message
- current mode (Run or Bypass)
- Armed/Disarmed status
- Channels in alarm

After the status report, you hear three beeps. The system waits 4 seconds for you to press # (ENTER), then 0 (System Status) for complete System Status information. The complete report includes:

- voice ID message
- current date and time
- current mode (Run or Bypass)
- Armed/Disarmed status
- "System on battery backup" message if applicable
- Channels in alarm
- Low battery or Bad Battery message if applicable
- "Program Holiday Calendar" message if applicable

The following sequence illustrates a remote System Status request.

What you enter	*What DiaLog says*
DiaLog telephone number	"This is DiaLog Plus. Run mode activated. System is armed. Channels in alarm: Channel 1."
	(Three beeps followed by 4-second wait)
#	
0 (System Status)	"System Status. This is DiaLog Plus. Monday, January 31, 1992. 8 hours, 32 minutes. Bypass mode activated. System is armed. Channels in alarm: Channel 1. Program Holiday Calendar."
	"Enter channel number or Star, Star (**) for all channels. Press Pound (#) if OK."
1	"Channel 1, Digital Input. The present status is in Alarm.
	"Enter channel number or * * for all channels. Press Pound (#) if OK."
#	"System ready. Enter selection."

When you press a channel number or ** for information on all channels, DiaLog delivers the channel alarm/On or normal/Off message(s). If a channel is in alarm but has been acknowledged, DiaLog adds "Acknowledged" after the alarm message.

At the front panel

At the front panel, press 0. DiaLog delivers the complete System Status report shown above.

1 Bypass mode

DiaLog Plus powers up in Bypass mode. It must be in Bypass in order for you to program, turn the speaker off and on, call out or listen in, and print reports. The only command that is not valid in Bypass mode is Acknowledge (* or 8) from a remote telephone.

To switch the system from Run to Bypass mode, press 1.

In Bypass mode, the green RUN/BYPASS indicator on the front panel is blinking.

What you enter	*What DiaLog says*
1 (Bypass)	"Bypass mode activated. System ready. Enter selection."

The Bypass command is a logged event.

If an alarm occurs while DiaLog Plus is in Bypass mode, the alarm indicator lights, the relay output is activated, and the alarm is logged to the optional printer. DiaLog does not dial out, however, until it goes into Run mode.

2 Run mode

When you complete your programming tasks, press 2 to switch DiaLog Plus into Run mode. Your program (with the exception of your recorded messages) is not saved to memory until the system goes into Run mode, and it must be in Run mode to take over alarm monitoring and notification.

The commands valid in Run mode are Acknowledge (* or 8 from a remote phone, ACK at the front panel), Cancel Alarm Callouts (HOME at the front panel), System Status (0) and Bypass (1).

In Run mode, the green RUN/BYPASS indicator on the front panel is steady On.

What you enter	*What DiaLog says*
2 (Run)	"Run mode activated. System ready."

If a Bypass to Run Delay is programmed, DiaLog automatically enters Run mode as soon as the delay times out. It then immediately starts callouts for any alarms that occurred while the system was in Bypass mode.

The Run command is a logged event.

5 Call Out

At the front panel, you can place an outgoing telephone call with the Call Out selection. The system must be in Bypass mode. As soon as you press 5, DiaLog Plus enables the speaker phone.

DiaLog rings the number for 30 seconds. If there is no answer, the command is cancelled and you are prompted, "System ready. Enter selection."

When a connection is made, DiaLog automatically gives the line to the person who is currently speaking, so either the speaker or the microphone is activated, but not both at the same time. After two minutes of conversation, you hear three warning beeps. To extend the call for two more minutes, press 5 immediately. You can extend the conversation as many times as you wish.

If you do not extend the conversation, DiaLog says "Bye" before breaking the connection. To hang up before the two-minute cutoff, press HOME. If the person at the other end hangs up first, DiaLog automatically breaks the connection.

Speaking over radio transmitter

If your DiaLog Plus system has the Radio Interface option, you can enter the Radio Transmission special character (*5) at the "Enter telephone number" prompt to speak your message over a radio transmitter. Press HOME to break the connection.

Call Out is a logged event. The date, time and telephone number called are logged to the optional printer.

What you enter	*What DiaLog says*
1 (Bypass)	"Bypass mode activated. System ready. Enter selection."
5 (Call Out)	"Speaker phone is enabled. Enter telephone number."
Up to 35 digits 0-9 and special characters; ENTER	(Places call.)

5 Listen In

At a remote telephone, the Listen In selection lets you hear sounds picked up by DiaLog's internal microphone, such as the noise of a pump motor.

DiaLog must be in Bypass mode. Press 5 to Listen In at any time during a call. The command turns on the microphone, and Listen In remains in effect for 25 seconds. At the end of the 25-second interval, you hear 3 warning beeps. Press 5 immediately to extend Listen In for 25 seconds more. You can extend Listen In as many times as you wish.

When Listen In times out, you return to the "System ready; enter selection" prompt. Listen In is automatically cancelled when the system goes from Bypass to Run mode.

Listen In is a logged event.

What you enter	*What DiaLog says*
1 (Bypass)	"Bypass mode activated. System ready. Enter selection."
5 (Listen In)	"Listen In enabled."

8 Print Configuration Report

If you are connected to a printer, this selection lets you print one of four separate configuration reports:

- Setup
- System Configuration
- Channel Configuration
- Telephone Lists

The system must be in Bypass mode.

When you select Channel Configuration, DiaLog prompts for a channel number. Enter a digit 0-8 or * * for a report on all channels.

The following sequence requests a report on all channels.

What you enter	*What DiaLog says*
1 (Bypass)	"Bypass mode activated. System ready. Enter selection."
8 (Print Configuration Report)	"Print Configuration Report. Enter report number or press Pound (#) if OK."
0 - Setup 1 - System configuration 2 - Channel configuration 3 - Telephone lists	"The selection is Report 2, Channel Configuration."
	"Enter channel number or Star, Star for all channels. Press Pound (#) if OK."
* *	"The report selection is all channels."
	(Report prints.)
	"System ready. Enter selection."

To cancel the channel configuration while the report is printing, press RESET.

9 then 6 Reset Channel Counters

Each DiaLog Plus channel has two counters associated with it: a Totalizer and a Duration Counter. The Totalizer keeps track of the number of times the channel goes from normal to off-normal state, while the Duration Counter keeps track of the number of minutes the channel is in the off-normal state. The counters automatically reset to zero when they reach their maximum values, 32767 for the Totalizer and 9999 for the Duration Counter.

You can use the Reset Counters key sequence to do an immediate reset of the counters, either to zero or, if you need an offset for your starting point, to another value. The system must be in Bypass mode. *4 (Global) applies to one reset at a time. For example, if you enter *4 at the "Totalizer reset" prompt, only the Totalizer reset value is applied to the selected and successive channels. You must enter *4 again at the "Duration reset" prompt to apply a Duration reset value to the selected and successive channels.

The following sequence resets the Totalizer and Duration counters for Channels 1-8 to zero.

What you enter	*What DiaLog says*
1	"Bypass mode activated. System ready. Enter selection."
9 (Channel Configuration)	"Channel Configuration. Enter channel number."
1	"Channel 1, Digital Input. Enter channel selection."
6 (Resets)	"Resets. **Totalizer Reset.** The present value is _____. Enter new value or press Pound (#) if OK."
*4 (Global)	"Global enabled."
0, then # (ENTER)	"The new value is zero."
	"Global disabled."
	"**Duration reset.** The present value is ____ minutes. Enter new value or press Pound (#) if OK."
*4 (Global)	"Global enabled."
0, then # (ENTER)	"The new value is zero minutes."
	"Global disabled."
	"Channel 1, Digital Input. Enter channel selection."

Appendix A

Specifications

General

Input/output channels	4 or 8 digital inputs, monitoring Normally Open or Normally Closed contacts. Open circuit voltage: 28 VDC; loop current: <1.5mA. One SPDT output relay, contact rating 16A at 250 VAC or 16A at 30 VDC.
Telephone number capacity	8 lists of 8 numbers or 4 lists of 16, user-selectable
Recorded speech capacity	8 seconds per input channel message; 8 seconds for System Identification message
Dialing format	Touch-Tone or pulse, automatically selected
Registration	FCC: 2DFUSA-65859-AL-E; DOC (Canada): 1782 4665 A
Certification	CSA: LR 88255
Ringer equivalence	0.4B
Printer port	RS-232C serial

Electrical

Power requirements	115 VAC ± 10% or 230 VAC ± 10%; 50 to 60 Hz; 15 watts. Maximum current draw on DC power: 500 mA at 6 VDC; 300 mA at 12 VDC.
Internal backup battery	6 VDC, 6.5 Ah gel cell, sealed lead-acid. 16.0 hours minimum backup at 86°F (30°C) 13.5 hours minimum backup at 32°F (0°C) 9.6 hours minimum backup at -4°F (-20°C)
Surge protection	Solid state surge protection provided on digital input, telephone and AC power circuitry.

Environmental

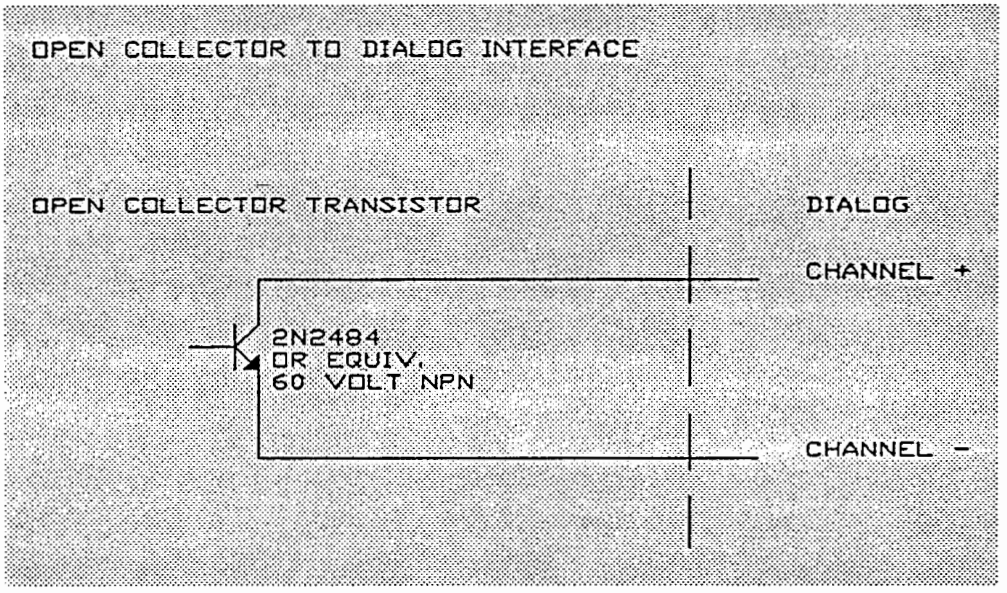
Operating temperatures	-4 to 140°F (-20 to 60°C)
Operating humidity	0-90%, non-condensing

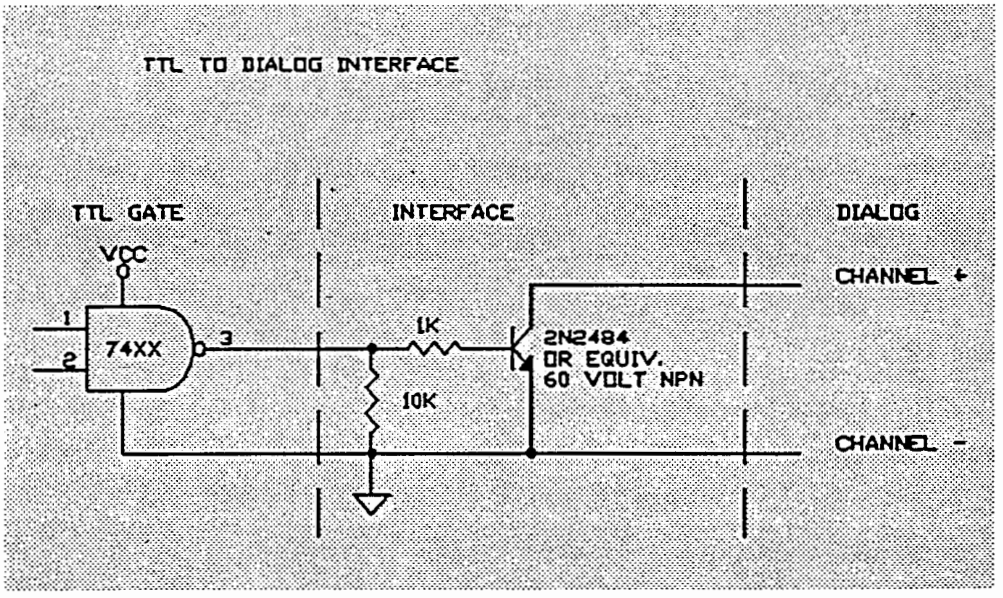
Physical

Dimensions	13.5"W x 11.3"H x 5.65"D (343mm W x 287mm H x 144mm D)
Weight	13 lbs. (5.9 kg)
Enclosure	NEMA 4X rated, fiberglass

Appendix B

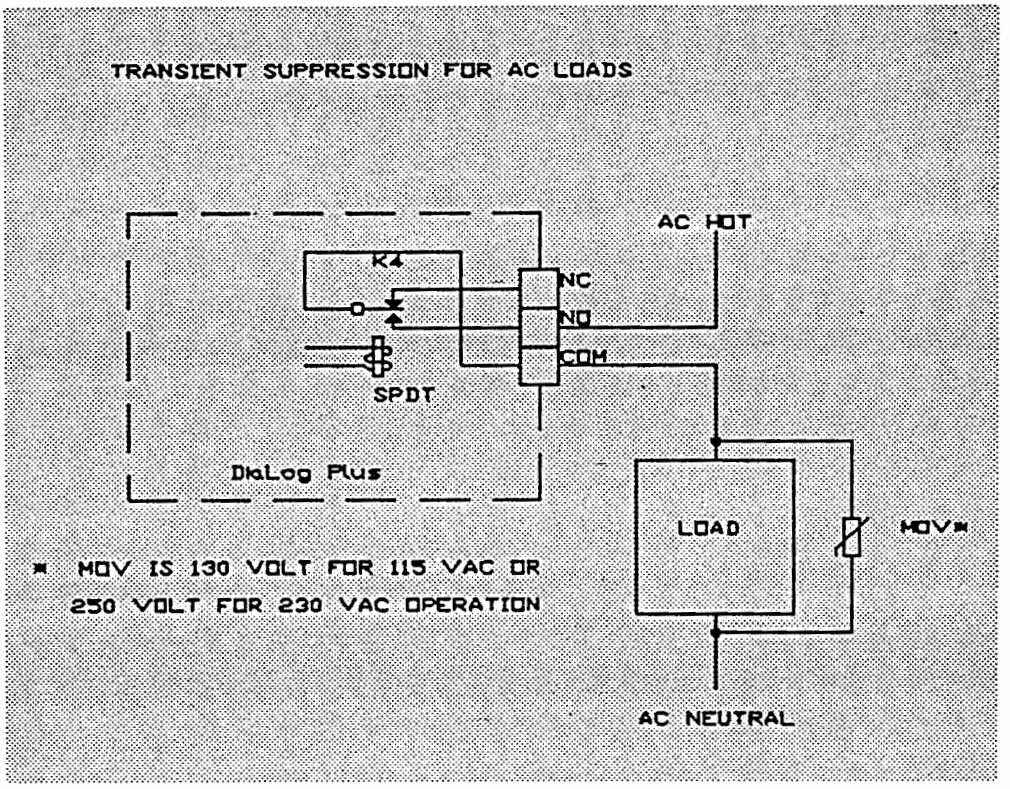
Open Collector/TTL Logic Interfaces

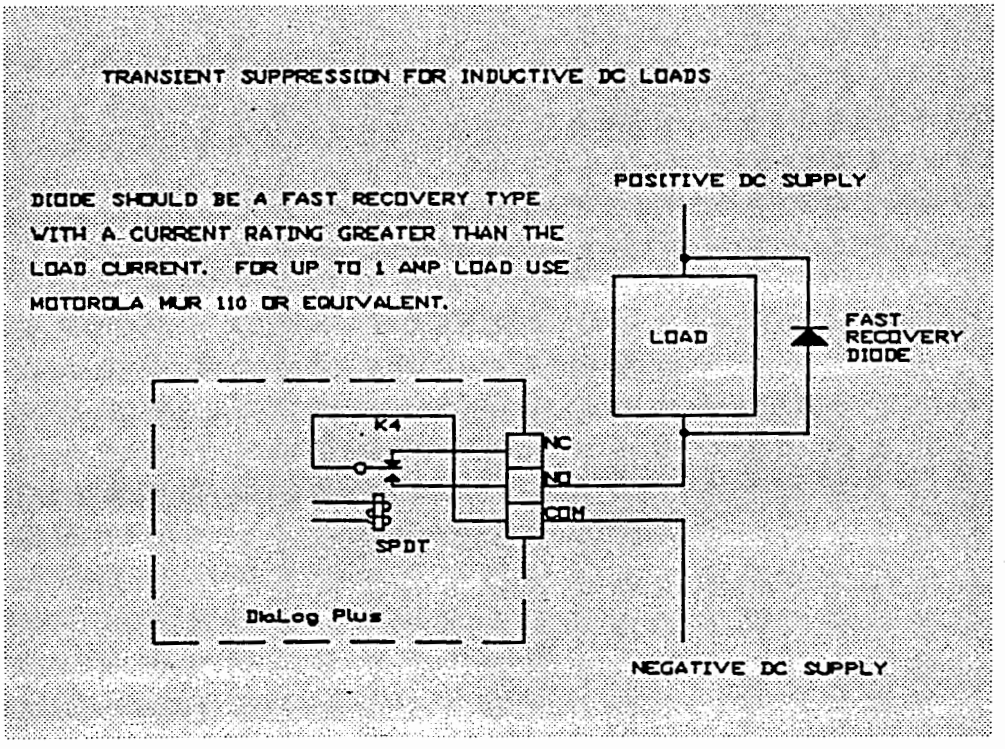




Appendix C

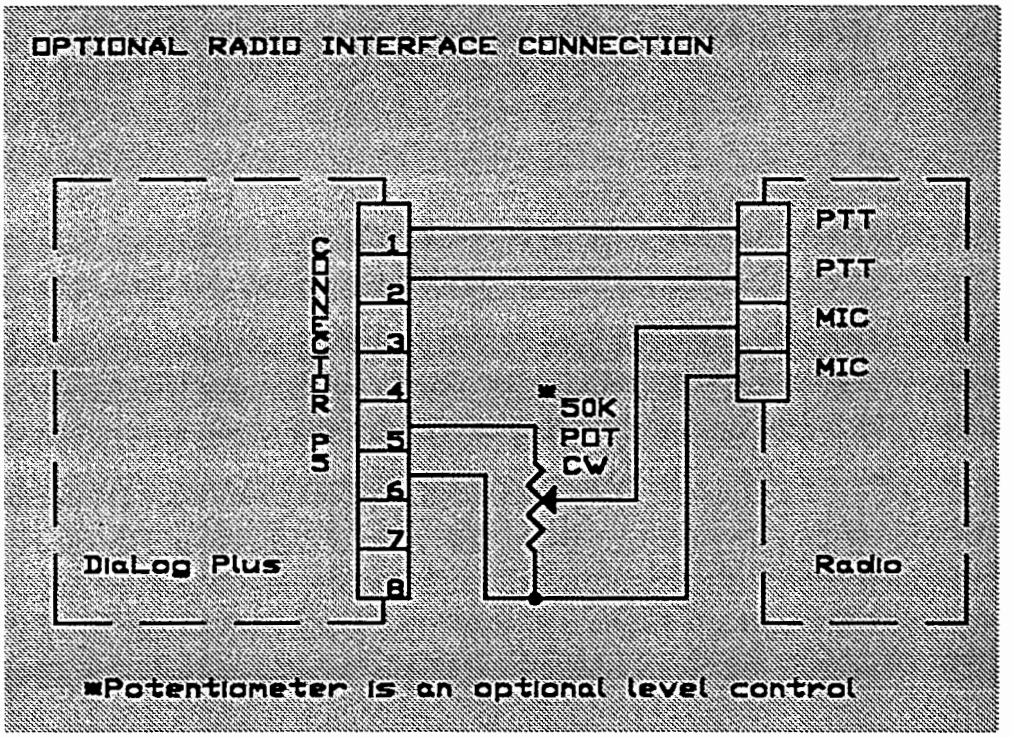
Relay Output Surge Suppression





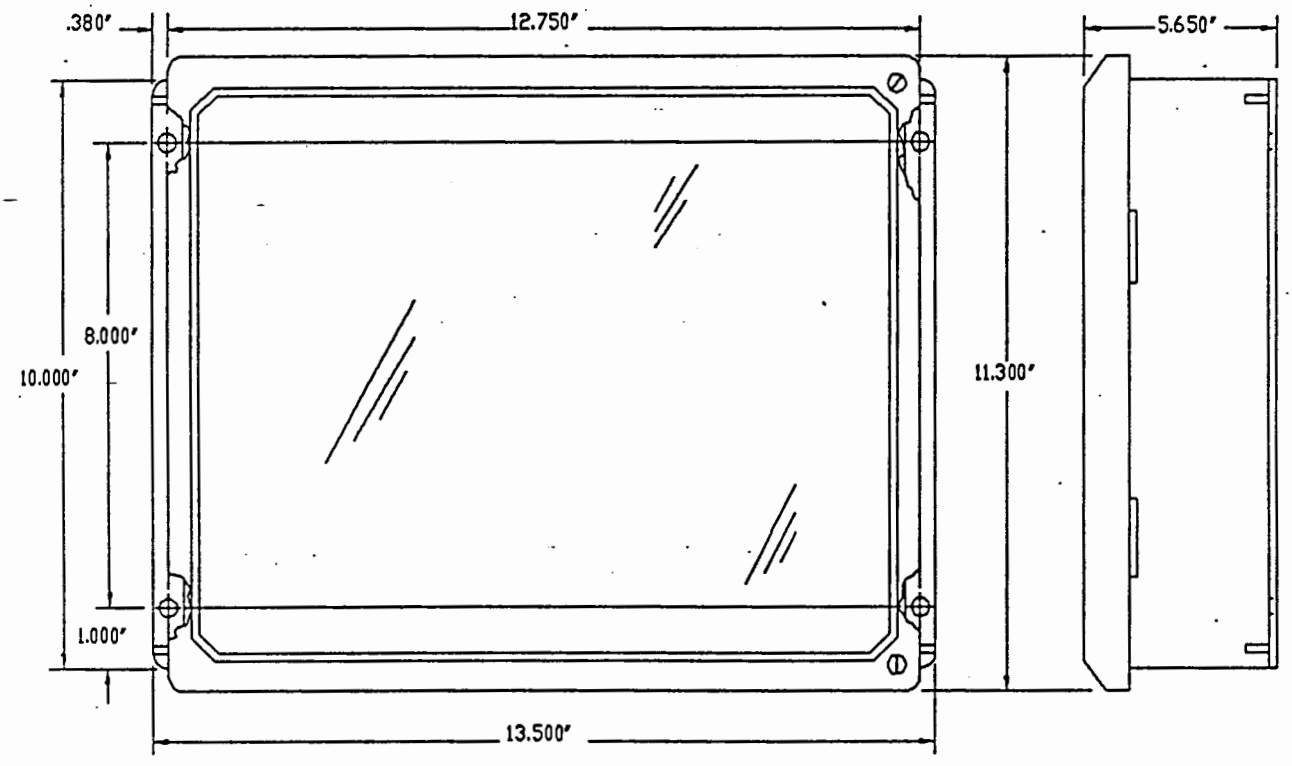
Appendix D

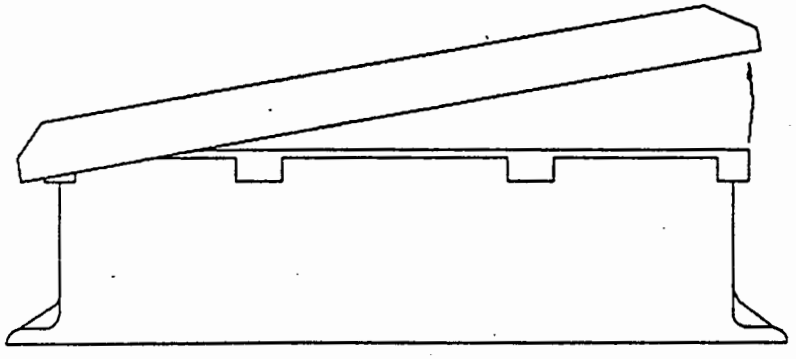
Radio Interface



Appendix E

Dimensions





Appendix F

Hardware Warranty and Assistance

Instrument warranty

Kaye Instruments' products are warranted against defects in materials and workmanship for a period of twelve months from the date of shipment. Kaye Instruments will, at its option, repair or replace products which prove defective during this warranty period provided they are returned to our facility in Bedford, Massachusetts. Repairs necessitated by misuse of this product are not covered by this warranty. *No other warranties are expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Kaye Instruments Inc. is not liable for consequential damages.*

Extended warranty

An additional 12 month warranty may be purchased at the time of the original order. All terms of the Instrument Warranty apply to the Extended Warranty.

In-warranty repairs

Customers are requested to discuss their problem with a Kaye Service Representative to insure a prompt and accurate assessment of their needs. Frequently, a problem can be resolved via phone or FAX with minimal inconvenience or delay.

If necessary, the Customer Service Representative will send replacement parts or authorize the return of the instrument to the factory for repair. Instruments serviced in this manner will be repaired and completely tested prior to shipment.

When an instrument is returned to the factory, the customer must prepay the freight charges. Kaye will prepay freight charges for the instrument's return via a comparable shipment method.

If Field Service is required under the warranty, the customer is responsible for travel and living expenses incurred by the Field Service Representative.

After-warranty repairs

Customers are requested to discuss their problem with a Kaye Service Representative to insure a prompt assessment of their needs. Frequently, a customer installed exchange part will solve the problem with minimal inconvenience and expense.

Factory repairs can frequently be completed on a fixed price basis. A base service fee plus labor and materials will be charged in lieu of the fixed repair price upon customer request or if extensive repairs are required.

Customers are requested to obtain a return authorization number prior to returning any instrument for service.

All instruments serviced at the factory will be repaired, updated and completely tested prior to shipment.

Equipment maintenance agreements

An optional DiaLog Plus Maintenance Agreement provides prompt repair or replacement service in the event of lightning damage or other instrument failure from any cause other than abuse. Please contact the Customer Service Department for additional details and prices at (800) 343-4624.

Customer support

Within 90 days of shipment from the factory, installation and initial configuration assistance will be provided at no charge via phone or FAX by a Customer Service Representative.

After 90 days from shipment, technical assistance or consultation will be limited to identification and resolution of instrument failures, unless a Customer Support Agreement has been purchased.

Customer support agreement

An optional Customer Support Agreement provides additional phone or FAX technical assistance for installation or program development. Contact the Customer Service Department for details.

Customer site assistance

Kaye can provide optional on-site personnel to assist with installation, initial operation, and training of plant personnel. Contact the Customer Service Department for details.

Applications assistance

Our Applications Engineers specialize in preparation of optional user defined programs for Kaye products. Please call our Applications Department for details of available services and rates.

Appendix G

Telephone Company rights and obligations

FCC Requirements

The Federal Communications Commission (FCC) has established rules that permit this device to be directly connected to the telephone network. Standardized jacks are used for these connections. This equipment should not be used on party lines or coin lines.

If this device is malfunctioning, it may also be causing harm to the telephone network. This device should be disconnected until the source of the problem can be determined and until repair has been made. If this is not done, the telephone company may temporarily disconnect service.

The telephone company may make changes in its technical operations and procedures. If such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes. You will be advised of your right to file a complaint with the FCC.

If the telephone company requests information on what equipment is connected to their lines, inform them of:
a. The telephone number this unit is connected to
b. The ringer equivalence number
c. The USOC jack required
d. The FCC registration number

Items b and d are indicated on the label.

The ringer equivalence (REN) is used to determine how many devices can be connected to your telephone line. In most areas, the sum of the REN's of all devices on any one line should not exceed five. If too many devices are attached, they may not ring properly.

Service requirements

In the event of equipment malfunction, all repairs should be performed by our company or an authorized agent. It is the responsibility of users requiring service to report the need for service to our company or to one of our authorized agents. Service can be obtained at:

Kaye Instruments
15 De Angelo Drive
Bedford, Massachusetts
800-343-4624, 617-275-0300
FAX 617-275-9024

Appendix H

FCC Rules, Class B

Modifications to a DiaLog Plus that are not expressly approved by Kaye Instruments could void your authority to use the system.

DiaLog Plus complies with the limits for a Class B digital device, specified in Part 15 of the FCC Rules, which guard against interference with residential radio and television reception. If interference does occur, try these corrective measures:

- Reorient or relocate receiving antenna.
- Increase the distance between the receiver and DiaLog Plus.
- Connect DiaLog Plus to a different circuit from the receiver.
- Consult Kaye Customer Service or an experienced radio/TV technician.

Appendix I

Power Up Diagnostic Tests

When one of the following power up diagnostic tests fails, DiaLog Plus loops on that test and the LED pattern freezes. You will not hear a voice prompt. To restart, power off and then on.

Except for Tests 4 and 5, where the Channel LED's indicate which areas of memory are being tested, the circuit diagnostics are indicated on the System LED's only (left side of panel).

In the illustrations, black circles indicate LED is On.

Test 0: LED's

System LED's and then Channel LED's light one at a time, top to bottom, and blink twice.

Test 1: Speech PROM Checksum LED pattern

- ●
- ●
- ○
- ○
- ○

Test 2: Program PROM Checksum LED pattern

- ●
- ○
- ●
- ○
- ○

Test 3: SRAM LED pattern (test writes, reads and verifies available areas of U35 SRAM chip)

- ●
- ●
- ●
- ○
- ○

Test 4: DRAM LED pattern (test writes, reads and verifies each of 4 banks of DRAM memory - U41 and U53. Channel 1-4 LED's indicate which bank is being tested).

- ●
- ○
- ○
- ●
- ○

Test 5: DSP Shared Memory LED pattern (test writes, reads and verifies each of 4 areas of DSP shared memory - U45, U50, U57 - lower 16K bytes, and U57 - upper 16K bytes. Channel LED's 1-4 indicate which area is being tested).

- ●
- ●
- ○
- ●
- ○

Test 6: DSP Code Load and Verify LED pattern (test copies the DSP code from the Program EPROM to the DSP Shared Memory area, reads and verifies what has been copied).

- ●
- ○
- ●
- ●
- ○

Appendix J

Battery Test Procedure and Reserve Power Estimates

To check the backup battery's available reserve:

- Press 1 to put DiaLog into Bypass mode.
- Make sure the power switch is On (INT position).
- Disconnect AC power (pull the plug or throw the circuit breaker).
- With a DC voltmeter, measure across the battery terminals. Hold the meter leads on the terminals for two minutes or longer, until the reading stabilizes. The reading is stable when the change over one minute is 0.1 VDC or less.
- On the appropriate chart below, match the stable voltmeter reading with the estimated available reserve power.

After you complete the test, reapply AC power and press 2 to put DiaLog into Run mode.

Standard Backup Battery, 6.5 Ah

DC reading	*Estimated reserve power at 68-104°F, in hours (±10%)*
6.4	16
6.3	14
6.2	12
6.1	10
6.0	8
5.9	6
5.8	3
5.7	1
5.6	0.5
5.5	0.0

Extended Backup Battery, 10 Ah

DC reading	*Estimated reserve power at 68-104°F, in hours (±10%)*
6.4	24
6.3	21
6.2	17
6.1	13
6.0	10
5.9	7
5.8	4
5.7	1
5.6	0.5
5.5	0.0

Glossary

Access Code	4-digit password that protects Bypass (programming) mode.
ACK key	Acknowledges all alarms simultaneously from front panel.
Acknowledge, remote (* or 8 key)	From a remote telephone, acknowleges channel alarm message(s) delivered by DiaLog Plus.
Between Calls Delay	Number of seconds DiaLog waits between alarm callouts. During this delay, a call to the system can acknowledge all alarms if Call In Acknowledge is enabled.
BKSP key (*0)	Deletes previous character in an entry.
Bypass mode	Programming mode. DiaLog must also be in Bypass mode for you to request configuration printouts, listen in from a remote telephone, or make a telephone call from the front panel.
Bypass to Run Delay	Number of minutes DiaLog remains in Bypass mode before automatically switching into Run mode.
Call In Acknowledge	If this feature is enabled, DiaLog waits for a return phone call acknowledging an alarm, before it calls the next number on the channel Telephone List.
Call on Limit	Channel mode in which alarm callout is initiated when the channel's Totalizer or Duration Counter reaches a programmable limit.
Call Out	At front panel, press 5 to use DiaLog as a speaker phone.
Channel	Reads the status of an input and holds programmable alarm notification instructions.

Channel Alarm Delay	Number of seconds an alarm condition must be present before DiaLog begins its programmed call-out sequence. Designed to prevent false alarms due to momentary abnormalities.
Channel alarm priority	Determined by the Telephone List assigned to the channel. List 1 has the highest priority and List 8 the lowest. If a channel with a higher priority goes into alarm while the system is calling out on a lower priority alarm, DiaLog interrupts the lower priority callouts until it notifies someone of the higher priority alarm and receives acknowledgement.
Channel State	Normal state of the contact at a digital input channel: Normally Open or Normally Closed.
Channel Messages	Programmable Alarm or On and Normal or Off messages spoken by DiaLog on alarm callouts and in System Status reports. Also includes factory-programmed messages for the value of the Totalizer and Duration counters, and the message for channels that are disabled.
Channel Mode	One of four programmable modes: *Disabled* (channel does not initiate alarm callouts and is not included in System Status reports), *Status Only* (does not initiate callouts but is included in System Status reports when in off-normal state), *Call on Alarm* (initiates callouts when in off-normal state), and *Call on Limit* (initiates callouts when a counter limit is reached).
Channel Telephone List	A list of telephone numbers assigned to a channel. DiaLog calls these numbers when the channel goes into alarm.
Channel Limits	Programmable limits on the Totalizer and Duration counters associated with each channel.
CLEAR key (*1)	Cancels programming entry and retains present selection.
Clock Format	Programmable 12-hour or 24-hour time format for DiaLog's status messages, voice prompts and optional printed log.
Counter Resets	Feature that lets you perform on-the-fly, immediate resets of channel Totalizers or Duration Counters to zero or another value.
Date Format	Programmable format that determines how DiaLog speaks and prints day, month and year.
Disarmed/Armed Schedule	Programmable timetable for disabling alarm callouts. Separate schedules for weekdays, weekends and holidays.
Delay character (*9)	Inserts a 2-second delay in telephone number.

Dial Tone Detect character (*8)	Instructs DiaLog Plus to wait for a dial tone before dialing additional characters.
Digital input	Digital high/low electrical signal indicating Closed/Open (ON/OFF) state of an external relay.
Duration Counter	Firmware counter associated with each channel that tracks the number of minutes the channel is in off-normal state.
ENTER (#)	At a remote phone, lets you start programming. During a programming sequence, retains present selection or enters data (not required with maximum length entry).
Global command (*4)	Key sequence that lets you program current day/channel and all successive days/channels with the same value.
Holiday Calendar	Programmable list of up to 20 days which DiaLog treats as holidays for the purpose of Status Notification and Disarmed/Armed Schedules.
HOME key (*6)	In Bypass mode, cancels entry, retains present selection and exits to "System ready; enter selection" prompt. In Run mode, at front panel, interrupts alarm callouts.
Listen In	Lets user at remote Touch-Tone telephone listen in to sounds picked up on DiaLog's internal microphone.
Memory Clear	Startup procedure to restore all parameters to factory settings.
Message Repeats	Programmable number of times DiaLog repeats message on an alarm callout.
MIC key	Selects microphone pickup level.
Normally Open/ Normally Closed	Normal state of each input channel, individually programmable.
OFF HOOK/RING	Indication at front panel and optional printer that DiaLog is making or receiving a call.
Pager character (*7)	Inserts signal in telephone number that tells DiaLog it is calling a display pager.
PHONE FAULT	Indication that DiaLog's telephone line is out of order.
Radio relay	Closes when a channel goes into alarm if DiaLog encounters the Radio Transmission character in the channel Telephone Number. Turns on a transmitter or annunciator.

Radio transmission character (*5)	Inserts signal in telephone number that tells DiaLog to turn on the relay component of the optional Radio Interface.
Redial After Acknowledge Delay	Amount of time DiaLog waits, after receiving acknowledgement of an alarm, for the alarm to clear before it restarts the notification process.
Redial Number	If this feature is enabled, DiaLog redials a busy number after the Between Calls Delay.
RESET key (*2)	At the "Enter new selection" prompt, restores factory setting and exits to previous prompt. At other prompts, exits to previous prompt.
Ring Count	Programmable number of rings DiaLog detects before answering an incoming call.
Run mode	Normal operating mode.
Setup	Configuration parameters that are generally set just once after the system is installed.
System Identification Message	Programmable voice message identifying system, for example, by location or function.
System Identification Number	Up to 18 characters 0-9, A-D, * or # used to identify system with callouts to a display pager or on printed log.
Status Notification Schedule	Programmable timetable for system status callouts. Up to four callouts per day; separate schedules for weekdays, weekends and holidays.
Status Only	Channel mode in which channel does not initiate alarm callouts but is included in System Status reports when it is in an off-normal state.
System Status	Report on system mode (Bypass or Run), Disarmed/Armed status and channels in alarm.
Telephone Lists	Number of lists: 8 lists of 8 telephone numbers, or 4 lists of 16 numbers.
Totalizer	Firmware counter associated with each channel that tracks the number of times a channel goes from normal to off-normal state.

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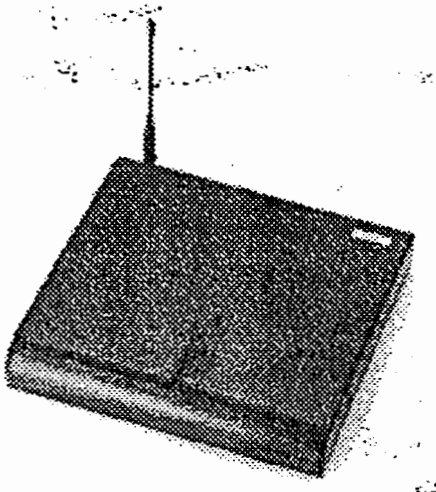
PCE OWNER'S MANUAL

INSTALLATION AND OPERATING INSTRUCTIONS



PCE-091592

Personal Communications Equipment

PCE

Owner's Manual

INSTALLATION AND OPERATING INSTRUCTIONS

Congratulations on the purchase of your new **PCE** unit. This product has been designed, manufactured and tested to deliver years of trouble-free performance.

Even if you are familiar with the operation of a mobile cellular telephone, this manual and it's contents are important reading. Please take time to understand your **PCE** unit and it's many convenient features.

Telular is proud to welcome you as a valued customer. Your satisfaction is our most important product. Should need arise, technical assistance is available during normal business hours (central time zone) by using our toll-free technical support number: **1-800-333-8899**

SAFETY PRECAUTIONS/IMPORTANT WARNINGS

WARNING

Telular does not represent this product to have been waterproofed. To reduce the risk of electrical shock, fire hazard, or damage to the product or any device attached thereto, do not expose to rain or moisture and under no circumstances use the product if wet.

IMPORTANT NOTE

Connection of this product to a PBX/PABX and/or KSU should be performed by an experienced telephone equipment installer.

FCC CLASS A COMPLIANCE

This equipment has been found to comply with the limits for a Class A digital device., pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FORWARD

This manual contains the installation and operation instructions for the **PCE** product. Service information is beyond the scope of this manual. These instructions assume that customer provided telephone equipment will meet all applicable governmental and communication network specifications.

NOTICE: Telular products are protected under U.S. and Canadian patent numbers 4,658,096, 4,737,975, 4,775,997, 4,868,519, 4,922,517, and 1,250,380.

TABLE OF CONTENTS

GENERAL INFORMATION

INTRODUCTION

Telular's Personal Communications Equipment (**PCE**) will permit the normal operation and direct integration of off-the-shelf telephone equipment and accessories into the cellular network. This Owner's Manual is intended to provide the necessary information to allow trouble-free installation and operation of the **PCE**. It is important to thoroughly familiarize yourself with this manual with particular attention being paid to the special user notes which appear in the shaded boxes throughout the manual. These notes highlight critical aspects of the instructions that can help you avoid frustrating delays in getting the **PCE** operational and allow you to get the best possible performance from your unit.

Your **PCE** has been carefully designed to provide years of dependable cellular access service (voice, fax or data) where land-line service is of substandard quality, cost prohibitive, unavailable on a timely basis, or when a wireless cellular communications link is desired for added security.

PCE - the system consists of a cellular transceiver, a MaxJack interface board, and a power input module. These components are mounted on a custom designed sheet-metal backing plate and enclosed by a fire retardant ABS plastic cover. The input power module may be configured for DC input, AC input, and AC input with battery back-up. The batteries, when provided, are mounted in a low profile housing which attaches directly to the back of the **PCE** unit.

The MaxJack interface simulates land-line telephone central office functions by providing:

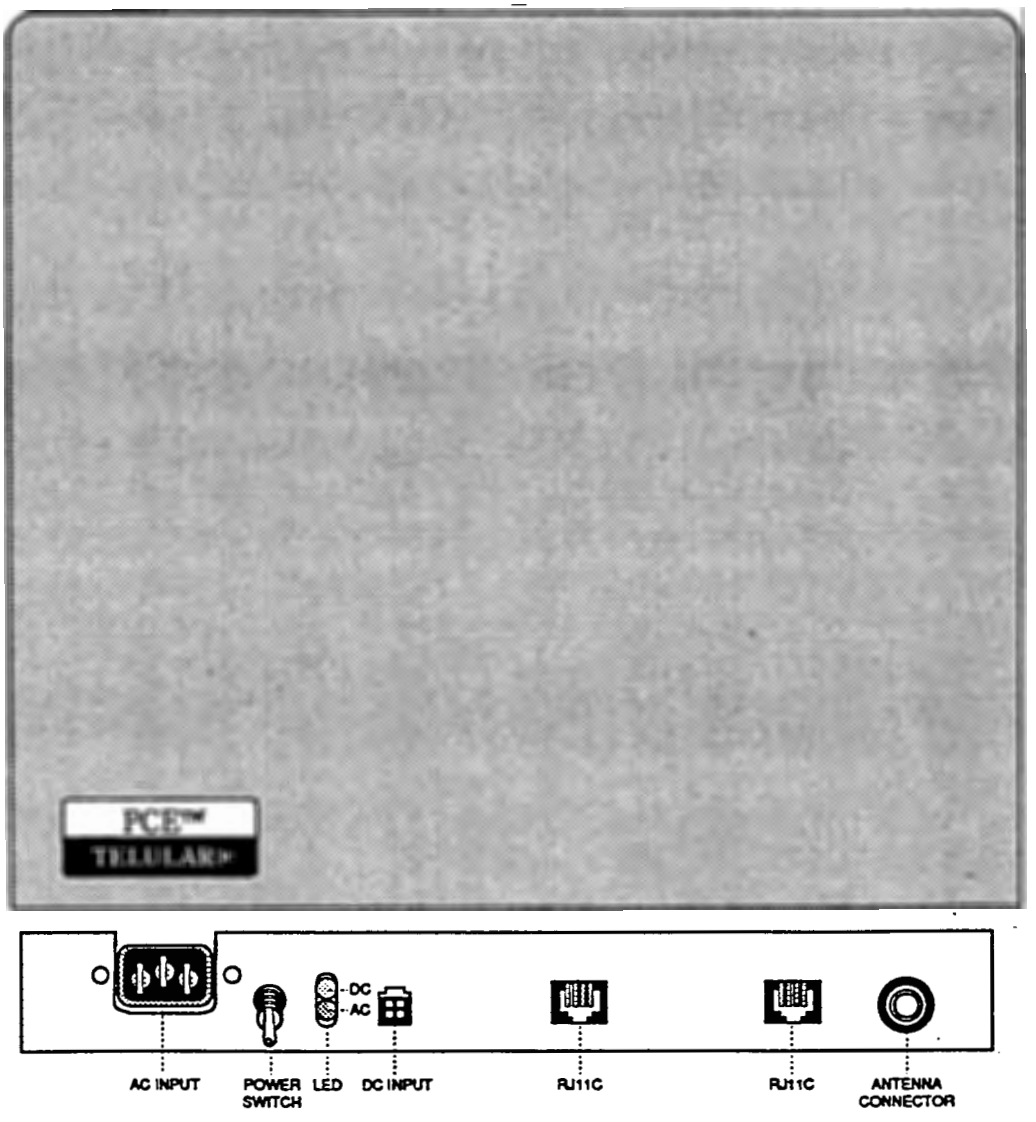
- Talk Battery (-48VDC)
- Normal Precision Dial Tone
- Decoding of Rotary Pulse and Tone Dialing
- Receiver Off Hook (ROH) Tone after 45 seconds
- Ring Voltage (with a Ringer Equivalence Number (REN) of 5.0A)
- Loop-start or ground-start operating modes

The **PCE** provides two RJ11C jacks, a 3-prong AC power receptacle, a 4-pin Molex receptacle for external DC input, and a bulkhead mounted TNC antenna connector to facilitate the appropriate connections.

Data transmission over the cellular network may require specialized cellular modems and/or error correcting algorithms and protocols. The MaxJack interface has been fitted with potentiometers to adjust transmit and receive audio levels. These have been set at the factory for normal voice applications. Data transmissions, especially at high speed, may require the modification of these settings. Furthermore, some cellular systems have been designed using T-Coded T1 or microwave links that may inhibit the passage of data. Contact Telular (708-256-8000) for additional information.

The illustration below identifies the location of the following connectors, LEDs and power switch on the PCE enclosure:

- One 3-prong AC power receptacle.
- One power switch
- AC/DC LED indicators
- One 4-pin MOLEX receptacle for external DC input.
- Two RJ11C jacks per PCE system, for easy connection of telephone equipment.
- One bulkhead mounted TNC antenna connector for easy connection of antenna equipment.

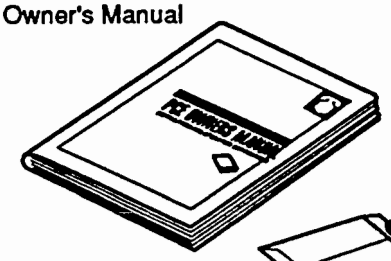


UNPACKING

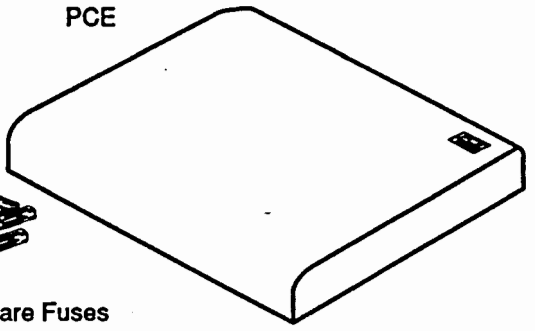
Carefully remove the unit from the shipping carton and check for evidence of shipping damage. If damage is found, call the shipping agent immediately. You will be instructed how to proceed. Retain all packing material for inspection, insurance claims, or possible reuse.

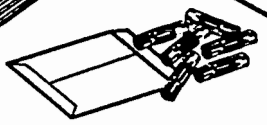
Inventory the contents of the carton to insure you have the following items:

Owner's Manual



PCE



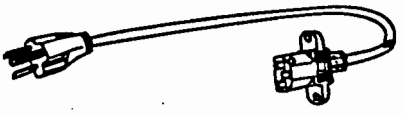


1 Packet Containing Spare Fuses

Antenna (Optional)

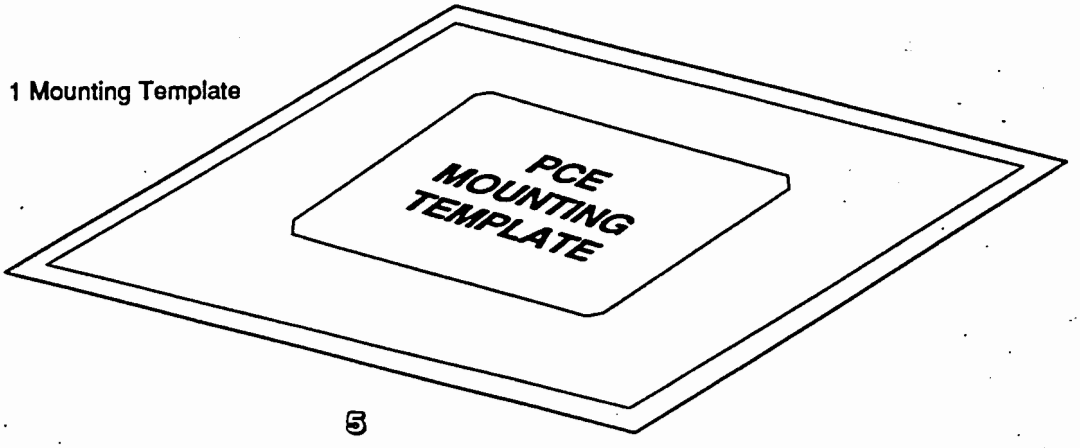
MOTOROLA Handset (Optional)

AC Power Cord



DC Power Cord (Optional)

1 Mounting Template



USER OPERATION

OPERATING INSTRUCTIONS

■ INSTALL THE PCE (REFER TO THE INSTALLATION SECTION).

Connect Telephone equipment to RJ11C jack.

■ TURNING ON THE PCE:

Normal Operation (When Plugged Into AC)

Turn on the power switch. The green and red indicators should illuminate.
The PCE is now ready for use.

Battery Operation (Optional)

Turn on the power switch. The green indicator should NOT illuminate.
Momentarily press the Battery Start button on the bottom of the battery enclosure. The green indicator should illuminate at this time.
The PCE is now ready for use.

Normal Operation (When Plugged Into DC)

Turn on the power switch. The green indicator should illuminate.
The PCE is now ready for use.

■ PLACING A CALL:

When the telephone is taken Off-Hook, the Maxjack determines whether cellular service is available. If service is available, precision dial tone is issued and a number can be dialed normally. The MaxJack interface reads the number as it is being dialed and determines when dialing is completed. It then automatically issues the dialed number to the transceiver and initiates a SEND command. There are no other buttons to push and nothing to program.

■ RECEIVING A CALL

When the cellular phone receives a call, it sends a message to the MaxJack interface which decodes this message. If the telephone equipment is On-Hook, the MaxJack interface produces ring voltage and the telephone will ring normally. To answer the call, simply lift the telephone receiver Off-Hook. The MaxJack interface will detect this Off-Hook condition, stop the ring voltage, and initiate a SEND command to the transceiver to complete the connection. If the telephone equipment is Off-Hook (dialing in progress), the MaxJack interface will signal the incoming call by an audible ringing in the telephone earpiece. A hookflash will answer the incoming call.

■ ENDING A CALL

To end a call, simply hang up the telephone instrument. The MaxJack interface will detect the On-Hook condition and issue an END command to the cellular transceiver.

SYSTEM FEATURES

■ HOOKFLASH

When the MaxJack interface board receives a hookflash from the attached telephone device, it will automatically initiate a SEND command to the cellular transceiver. This feature facilitates the use of special cellular services which may be available in your cellular service area. See the section titled Special Cellular Services for more details.

■ INCOMING CALL ANNOUNCEMENT

If you happen to be dialing a number while an incoming call occurs, the MaxJack interface will signal the incoming call during dialing by producing an audible ring in the ear piece. A simple hookflash will connect the incoming call. This feature is not to be confused with Call Waiting.

■ USER ADJUSTABLE VOLUME LEVELS

Both the transmit (Tx) and receive (Rx) audio levels can be adjusted on the MaxJack interface board. This allows adjustment in case the audio levels in the telephone equipment are too high or too low. Adjusting the potentiometer clockwise will increase the audio level and counter-clockwise will decrease the audio level.

■ ROAM DIAL TONE

The MaxJack interface has the ability to produce a special dial tone as an audible indication that the cellular transceiver is in the "Roam" mode. This roam dial tone is higher pitched than the normal dial tone and can be enabled or disabled using jumper 4.3 (See User Selectable Options).

■ LOCK TONE

If the cellular transceiver is "Locked", the MaxJack interface will produce a low-pitched steady tone instead of either normal or roam dial tone when the telephone equipment is taken Off-Hook.

■ NO SERVICE TONE

If the cellular transceiver is in a "No Service" condition, the MaxJack interface will produce a high-pitched steady tone instead of either normal or roam dial tone as an audible indication of the "No Service" condition.

■ AUTOMATIC INTERNAL BATTERY RECHARGING (OPTIONAL)

Contained within the AC power supply is a multi-feature battery charging circuit. This circuitry constantly trickle charges the batteries while protecting them from damage caused by high or low voltages. The batteries will automatically recharge as long AC power is available and the power switch is in the ON position.

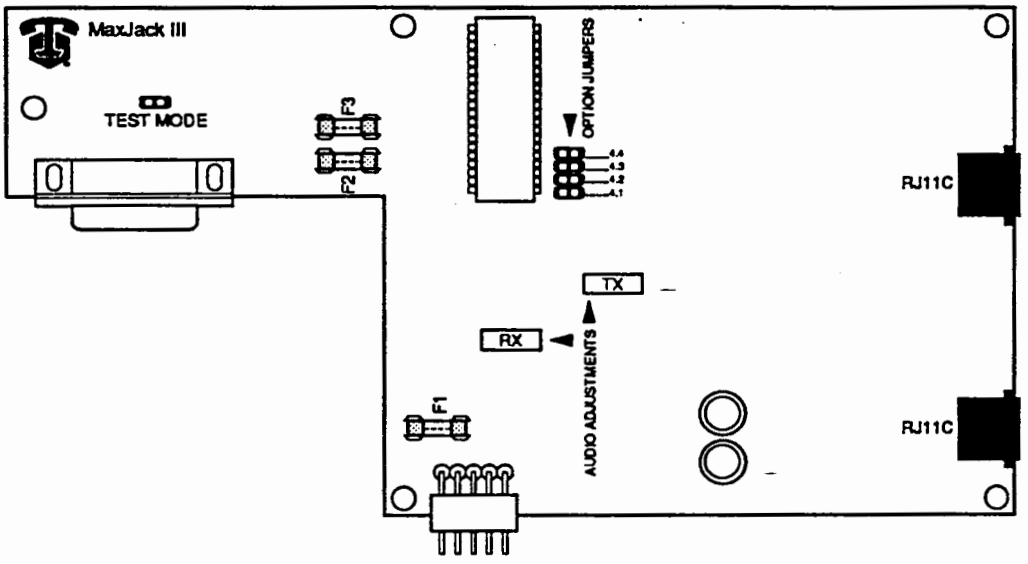
■ AUTOMATIC BATTERY BACKUP (OPTIONAL)

The PCE batteries are always in the power circuit which means that a cellular call in progress will not be dropped if AC power is lost. Should the AC power remain off, the batteries are capable of providing several hours of uninterrupted service. If the battery voltage should fall below a predetermined value representing reliable operating voltage (approximately 10.5V), the charging circuit will automatically disconnect the batteries, removing power from the MaxJack interface and the cellular transceiver until AC power is once again available.

■ BATTERY ONLY OPERATION (OPTIONAL)

There is a safety feature in the Telular charging circuit which will not allow start-up of the PCE unless AC power is available. This is a precaution against allowing start-up if the stand-by batteries are drained to the point where reliable operation cannot be assured. This feature may be by-passed by turning on the power switch and depressing the battery start button located on the battery housing. This will allow start-up directly from the stand-by batteries.

USER SELECTABLE OPTIONS AND AUDIO LEVEL ADJUSTMENT



There are four user selectable options on the MaxJack interface board. These options are selected by installing or removing the provided jumper. The location of the option jumpers is shown in the above figure.

■ JUMPER 4.1 - DATA AFTER SEND

When a telephone number is being dialed, the MaxJack interface automatically converts the pulse or tone dialing signals into the digital data required by the cellular transceiver. Once the phone number has been sent to the transceiver (followed by a SEND command), the MaxJack interface will ignore any further dialing activity until the call is completed.

Some optional features of cellular systems (such as three-way conference calls) require that additional numbers be dialed and transmitted to the cell site. In order to accommodate these features, Telular has installed an option on the MaxJack interface board to allow DTMF after-dialing activity once the call is connected.

When jumper 4.1 is installed, the MaxJack interface will ignore additional dialing activity, thus allowing DTMF signals (tones) generated from the telephone keypad to be directly transmitted over the air as audio (factory preset).

With jumper 4.1 removed, the MaxJack interface will convert any additional telephone keypad dialing activity into digital data and immediately send this data to the cellular transceiver.

■ JUMPER 4.2 - LOOP-START/GROUND START

Loop-start and ground-start are terms that refer to the method used by telephone equipment to signal the telephone company that it is Off-Hook and looking for dial tone. If the MaxJack interface is set up for loop-start equipment and ground-start equipment is actually being used, it will not detect the Off-Hook condition and will not provide dial tone or allow a number to be dialed. The opposite is also true: if the MaxJack interfaces set up for ground-start equipment and loop-start equipment is actually being used, it will not detect the Off-Hook condition and will not provide dial tone or allow a number to be dialed. The large majority of telephone equipment on the market is loop-start equipment. This includes extension telephones, fax machines, computer modems, answering machines, autodialers, etc. Accordingly, the MaxJack interface is set up at the factory to operate with loop-start equipment. PBX systems are commonly ground-start equipment while KSUs are commonly loop-start equipment.

When jumper 4.2 is installed, the MaxJack interface is set up for loop-start equipment.

When jumper 4.2 is removed, the MaxJack interface is set up for ground-start equipment.

Many ground-start equipment manufacturers utilize a variety of different electrical and software timing techniques and specifications. (See Application Note in Appendix D)

■ JUMPER 4.3 - ROAM DIAL TONE

The MaxJack interface has the ability to produce a special dial tone as an audible indication that the cellular transceiver is in the "Roam" mode. This roam dial tone is higher pitched than the normal dial tone. Most auto-dial devices (fax machines, modems, etc.) require a normal precision dial tone to operate. If the roam dial tone in enabled, it could interfere with the normal operation of these auto-dial devices.

When jumper 4.3 is installed, the roam dial tone is enabled.

When jumper 4.3 is removed, the roam dial tone is disabled, and a normal precision dial tone is produced even if the cellular phone is roaming.

■ JUMPER 4.4 - FOUR-SECOND TIMER/DIGIT ANALYSIS

When a phone number is being dialed, the MaxJack interface automatically determines when dialing activity has ended. It does this in one of two ways. The first method is digit analysis, based upon the North American Dialing Plan. The MaxJack interface analyzes the phone number as it is being dialed to determine if it is long-distance, operator assisted, local, etc. When it has received the proper number of digits, it sends the phone number followed by a SEND command to the cellular transceiver. The alternate method is a 4-second timer. This timer is started by the first digit dialed, and gets restarted by any following digits. If 4 seconds elapse after a digit has been dialed, the MaxJack interface assumes that dialing activity has ended and sends the number dialed (followed by a SEND command) to the cellular transceiver.

When jumper 4.4 is removed, digit analysis is used to determine the end of dialing activity.

When jumper 4.4 is installed, a 4-second timer is used to determine the end of dialing activity.

■ TRANSMIT AND RECEIVE AUDIO LEVEL ADJUSTMENT

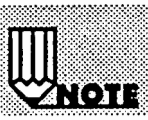
The MaxJack interface board has transmit and receive audio level adjustment capability through a set of potentiometers. The potentiometers are located in the middle of the interface board as shown on page 9.

The audio levels for the MaxJack board are pre-set at the factory for mid-range performance in conjunction with the cellular transceiver manufacturers technical specifications. The mid-range setting is utilized because of the predominant use of the **PCE** unit for voice communications. While the pre-set audio levels are generally acceptable for voice transmission, users desiring to transmit data through the **PCE** may attempt to optimize data transmission performance by making audio level adjustments to the MaxJack interface board. Setting the transmit (Tx) potentiometer to a lower setting often yields the best data transmission results. This is accomplished by turning the Tx potentiometer in a counter-clockwise direction. This adjustment should be done for PCEs that are operating in a "dedicated" mode. Otherwise, you will need to find the most acceptable balance between voice levels and desired data transmission capabilities based on your operating environment.

Cellular data transmission through-puts are typically not as fast as dial-up or dedicated copper or fiber links. Further, it is important to note that while results vary between user locations, normal landline modems without error-correcting protocols may not yield acceptable data transmission results. However, many users have reported acceptable high-speed, error-free transmission (up to 17 kpbs) using special cellular modems with error-correcting techniques. This is especially true in a fixed cellular environment where the ability to establish an optimum RF transmission path between the **PCE** and the cellular system cell site is considerably better than in a mobile environment. Telular recommends thorough testing of any data modem prior to inclusion in a cellular data network configuration.

SPECIAL CELLULAR SERVICES

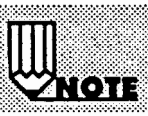
Most cellular systems offer special services such as call waiting, call forwarding, three-way conference calls, voice mail, etc. These are service features which must be purchased from the cellular carrier. They require certain dialing sequences to be entered which vary from system to system. Your cellular carrier will provide the dialing information for your local system when you purchase these services.



Most of these features require the * button. Pulse and rotary phones do not have this code, so tone dialing is required if these features are to be accessed through the MaxJack Interface.

■ CALL FORWARDING:

Since the digits being dialed do not conform to the standard telephone number format, the digit analysis program will not allow these features to be accessed through the MaxJack interface. For call forwarding, jumper 4.4 must be installed (4-Second Timer).



The MaxJack Interface will automatically add the SEND command.

■ CALL WAITING:

For Call Waiting, jumper 4.1 (Data After Send) must be removed for the MaxJack interface to convert the dialed digits into the data required by the cellular system. The MaxJack interface will not automatically issue the SEND command since there is a call in progress. A hookflash will be needed to generate the SEND command.

■ THREE-WAY CONFERENCE CALLS:

This feature requires entering the telephone number of the third party to be connected followed by SEND. Since there is a call in progress, the MaxJack interface will not automatically issue a SEND command, therefore a hook-flash will be required to issue a SEND command. For this feature, jumper 4.1 (Data After Send) must be removed.

■ VOICE MAIL:

This feature is accessed using a code in front of the phone number of the cellular phone. For this reason, jumper 4.4 (4-Second Timer) must be installed. Once the connection is made with the Voice Mail service, DTMF tones are used to access the various commands, so Data After Send is not required and jumper 4.1 must be installed.

There are other special cellular services available in some areas (i.e., in the Chicago area, *999 is used to report traffic problems). In the Chicago area, this feature can be accessed without using hookflash to generate a SEND command by dialing *999000. This dialing format may or may not work in your area.

EQUIPMENT INSTALLATION

MATERIALS REQUIRED FOR INSTALLATION

1. Four #6 sheet metal screws, 1 1/2" in length (supplied in mounting kit).
   If installing the optional battery backup unit, use the screws supplied with that unit.

2. If the PCE is to be mounted on dry-wall, it is recommended that toggle bolts are used. These toggle bolts are supplied by the customer and should have heads that will fit in the mounting keyholes of the PCE.

3. If the battery back-up unit is to be mounted on dry-wall, 3/4" plywood is recommended as a backplate.

■ TOOLS REQUIRED FOR INSTALLATION

1. Electric drill and bits.

2. Phillips screwdriver or appropriate tool for hardware selected to mount PCE or Battery Back-up Unit.

■ PRE-INSTALLATION PREPARATIONS

If the PCE unit was not purchased with the cellular transceiver pre-programmed, the transceiver should be programmed at this time. Refer to the appropriate programming instructions in Appendix A.

Plan the layout of the installation to include:

1 A suitable trial mounting location for the antenna, ideally 10 feet above the ground and the shortest practical distance (not more that 50 feet) from the PCE unit. Refer to Appendix B for more information concerning antenna installation.

2 A mounting location for the PCE unit that provides sufficient space to work. There should be at least 6 inch of open space on all sides of the PCE to allow for the removal and installation of the plastic cover. It should be dry, away from overhead water pipes, free of airborne contaminants, and protected from the weather. It should be within 6 feet of a properly grounded AC outlet (AC versions only). If the PCE is being installed on dry-wall, 3/4 inch plywood is recommended as a backplate.

3 Affix the proper template to your selected site, step back, and visualize the installation and connections.

Remember, the professional job is carefully planned, always keeping in mind the identification and elimination of potential problems. It should also include bench-testing of the unit prior to actual installation.

■ SAFETY NOTE

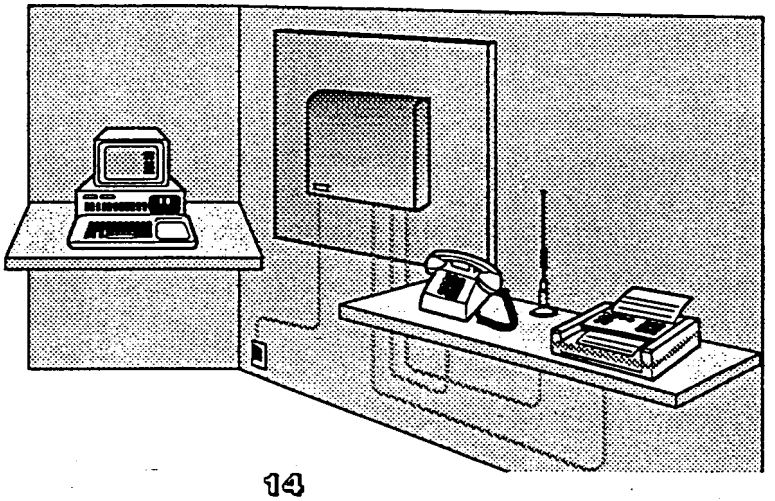
GROUNDING - Before installing the PCE unit, confirm that the AC power at the installation site is properly grounded.

PCE INSTALLATION (AC ONLY)

Installation procedures vary depending on the type of **PCE** being installed.
Please refer to the appropriate section for the model of **PCE** you have purchased.

AC VERSION WITHOUT BATTERY BACK-UP UNIT

1. Make sure that the surface on which the **PCE** will be mounted is dry and able to support the unit.
2. Using the provided template, mark the positions on the mounting surface where the four mounting screws should be driven. Then drill pilot holes.
3. Install the four mounting screws, leaving approximately 1/2 inch between the wall and the head of the screws.
4. On the bottom of the **PCE** insure the power switch is in the off position.
5. On the sides of the **PCE** remove the six screws that hold the plastic cover on the bottom plate. Remove the plastic cover from the **PCE**.
6. Place the **PCE** over the four mounting screws, aligning the heads of the mounting screws with the bottom hole of the four keyhole slots. Slowly slide the **PCE** down over the shaft of the screw. Tighten the four mounting screws. Carefully test the strength of the mounting to be sure the unit is secure.
7. Replace the plastic cover, and tighten the six screws.
8. Connect the end of the antenna cable to the antenna connector mounted on the bottom of the cabinet.
9. Connect the AC power cord to the jack on the bottom of the cabinet and secure it with the provided screws. Connect the other end to a properly grounded AC outlet.
10. Connect a standard tone or pulse telephone to one of the RJ11 jacks on the bottom of the **PCE**. This telephone will be required for system testing.



SYSTEM TEST PROCEDURE (AC ONLY)

The following procedure will test all normal functions of the PCE. If any step fails, refer to Appendix C, Troubleshooting.

NOTE: This system test procedure assumes that your PCE unit is programmed and has been delivered with the User Selectable Options configured as follows:

data after send - enabled
loop-start/ground-start - loop-start
roam dial tone - enabled
4-second timer - disabled (digit analysis enabled)

1. Turn on the power switch. Notice that the both the green and red indicators should now be illuminated.

2. Pick up the telephone handset and listen for a normal dial tone. If normal dial to is heard, go to step 3. Otherwise, refer to Appendix C.

NOTE

If a phone is kept Off-Hook for more than 45 seconds without any dialing activity, the MaxJack interface will issue a Receiver Off-Hook (ROH) tone which sounds like a busy signal. To restore normal operation, hang up the phone instrument for at least two seconds.

3. Test the unit by dialing a local number. The call should be processed and connected normally.

NOTE

Cellular transceivers typically process calls somewhat slower than land-line systems.

4. Now, place an incoming call to the PCE from another phone. When the phone connected to the PCE rings, answer the call. If the ringing stops and the connection is completed, the unit is receiving calls properly.

5. If reception is strong and clear, the antenna may now be permanently affixed. If not, you may attempt to improve the clarity by changing the direction, type, and/or location of the antenna. Experience has proven that as little as 6 inches can make a significant difference in quality and clarity of the signal. Refer to Appendix B.

NOTE

If the transmit and/or receive audio levels are too high or too low, or if echo is experienced, adjustment of the Tx/Rx potentiometers on the MaxJack interface may be required. Refer to page 11 for adjustment procedures.

6. The PCE unit is now ready for normal operation. Refer to the sections on Operation, Features, User Selectable Options, and Application Notes for information concerning your intended application.

PCE INSTALLATION
(BATTERY BACK-UP)

1. Make sure that the surface on which the BBU (Battery Back-up Unit) will be mounted is dry and able to support the unit. If installing the BBU on dry-wall, 3/4 inch plywood is recommended as a backplate.

2. Using the template provided with the BBU, mark the positions on the mounting surface where the four mounting screws should be driven. Then drill pilot holes.

3. Install the top two mounting screws, leaving approximately 1/2 inch between the wall and the head of the screws.

4. Placed the BBU over the two mounting screws, aligning the heads of the mounting screws with the bottom hole of the top two keyhole slots. Slowly slide the BBU down over the shaft of the screws. Tighten the two mounting screws. Install the remaining two mounting screws. Carefully test the strength of the mounting to be sure the unit is secure.

5 On the bottom of the **PCE** insure the power switch is in the off position.

6. On the sides of the **PCE** remove the six screws that hold the plastic cover on the bottom plate. Remove the plastic cover from the **PCE**.

7. Placed the PCE over the four mounting screws (located on the BBU), aligning the heads of the mounting screws with the bottom hole of the four keyhole slots. Slowly slide the **PCE** down over the shaft of the screws. Tighten the four mounting screws. Carefully test the strength of the mounting to be sure the unit is secure.

7. Replace the plastic cover, and tighten the six screws.

8. Connect the end of the antenna cable to the antenna connector mounted on the bottom of the **PCE**.

9. Connect the DC power cord from the BBU to the DC input connector on the **PCE**.

10. Connect the AC power cord to the jack on the bottom of the **PCE** and secure it with the provided screws. Connect the other end to a properly grounded AC outlet.

11. Connect a standard tone or pulse telephone to one of the RJ11 jacks on the bottom of the **PCE**. This telephone will be required for system testing.

SYSTEM TEST PROCEDURE (BATTERY BACK-UP)

The following procedure will test all normal functions of the PCE. If any step fails, refer to Appendix C, Troubleshooting.

NOTE: These system test procedure assumes that your PCE unit is programmed and has been delivered with the User Selectable Options configured as follows:

data after send - enabled
loop-start/ground-start - loop-start
roam dial tone - enabled
4-second timer - disabled (digit analysis enabled)

1. Turn on the power switch. Notice that the both the green and red indicators should now be illuminated.

2. Pick up the telephone handset and listen for a normal dial tone. If normal dial to is heard, go to step 3. Otherwise, refer to Appendix C.

NOTE

If a phone is kept Off-Hook for more than 45 seconds without any dialing activity, the MaxJack interface will issue a Receiver Off-Hook (ROH) tone which sounds like a busy signal. To restore normal operation, hang up the phone instrument for at least two seconds.

3. Test the unit by dialing a local number. The call should be processed and connected normally.

NOTE

Cellular transceivers typically process calls somewhat slower than land-line systems.

4. Now, place an incoming call to the PCE from another phone. When the phone connected to the PCE rings, answer the call. If the ringing stops and the connection is completed, the unit is receiving calls properly.

5. If reception is strong and clear, the antenna may now be permanently affixed. If not, you may attempt to improve the clarity by changing the direction, type, and/or location of the antenna. Experience has proven that as little as 6 inches can make a significant difference in quality and clarity of the signal. Refer to Appendix B.

NOTE

If the transmit and/or receive audio levels are too high or too low, or if echo is experienced, adjustment of the Tx/Rx potentiometers on the MaxJack interface may be required. Refer to page 11 for adjustment procedures.

6. Turn off the power switch. Both the red and green LEDs should go out. Unplug the AC power cord from the wall outlet.

7. Turn on the power switch and momentarily press the Battery Start button located on the battery back-up unit. The green LED should illuminate. Place an outgoing call to insure unit is operating properly on battery power.

8. Turn off the power switch. The green LED should go out. Plug the AC power cord back into the wall outlet. Return the power switch to the ON position.

9. The PCE is now ready for normal operation. Refer to the sections on Operation, Features, User Selectable Options, and Application Notes for information concerning your intended application.

PCE INSTALLATION (DC ONLY)

1. Make sure that the surface on which the **PCE** will be mounted is dry and able to support the unit.

2. Using the provided template, mark the positions on the mounting surface where the four mounting screws should be driven. Then drill pilot holes.

3. Install the four mounting screws, leaving approximately 1/2 inch between the wall and the head of the screws.

4 On the bottom of the **PCE** insure the power switch is in the off position.

5. On the sides of the **PCE** remove the six screws that hold the plastic cover on the bottom plate. Remove the plastic cover from the **PCE**.

6. Placed the **PCE** over the four mounting screws, aligning the heads of the mounting screws with the bottom hole of the four keyhole slots. Slowly slide the **PCE** down over the shaft of the screw. Tighten the four mounting screws. Carefully test the strength of the mounting to be sure the unit is secure.

7. Replace the plastic cover, and tighten the six screws.

8. Connect the end of the antenna cable to the antenna connector mounted on the bottom of the cabinet.

9. Connect the DC power cord to the DC power source. The red wire should be connected to positive (+), and the black wire should be connected to negative (-).

10. Connect the other end of the DC power cord to the DC input jack on the bottom of the cabinet.

11. Connect a standard tone or pulse telephone to one of the RJ11 jacks on the bottom of the **PCE**. This telephone will be required for system testing.

SYSTEM TEST PROCEDURE (DC ONLY)

The following procedure will test all normal functions of the **PCE**. If any step fails, refer to Appendix C, Troubleshooting.

NOTE: These system test procedure assumes that your PCE unit is programmed and has been delivered with the User Selectable Options configured as follows:

data after send - enabled
loop-start/ground-start - loop-start
roam dial tone - enabled
4-second timer - disabled (digit analysis enabled)

1. Turn on the power switch. Notice that the green indicator should now be illuminated.

2. Pick up the telephone handset and listen for a normal dial tone. If normal dial tone is heard, go to step 3. Otherwise, refer to Appendix C.

NOTE

If a phone is kept Off-Hook for more than 45 seconds without any dialing activity, the MaxJack Interface will issue a Receiver Off-Hook (ROH) tone which sounds like a busy signal. To restore normal operation, hang up the phone instrument for at least two seconds.

3. Test the unit by dialing a local number. The call should be processed and connected normally.

NOTE

Cellular transceivers typically process calls somewhat slower than land-line systems.

4. Now, place an incoming call to the **PCE** from another phone. When the phone connected to the **PCE** rings, answer the call. If the ringing stops and the connection is completed, the unit is receiving calls properly.

5. If reception is strong and clear, the antenna may now be permanently affixed. If not, you may attempt to improve the clarity by changing the direction, type, and/or location of the antenna. Experience has proven that as little as 6 inches can make a significant difference in quality and clarity of the signal. Refer to Appendix B.

NOTE

If the transmit and/or receive audio levels are too high or too low, or if echo is experienced, adjustment of the Tx/Rx potentiometers on the MaxJack Interface may be required. Refer to page 13 for adjustment procedures.

6. The **PCE** is now ready for normal operation. Refer to the sections on Operation, Features, User Selectable Options, and Application Notes for information concerning your intended application.

TECHNICAL SPECIFICATIONS

MAXJACK III INTERFACE

■ TELEPHONE INTERCONNECTION:

A:	Connector Type =	RJ11C, .156 Header, .100 Header
B:	Two Wire Circuit =	Tip/Ring
C:	Voltage =	-48VDC (Open Circuit), -30VDC Source (Off-Hook)
D:	Current =	51mA (Short Circuit)
E:	Mode =	loop-start or ground-start
F:	DC Feed Resistance =	480 Ohms
G:	AC Termination Impedance =	600 Ohms
H:	Max Loop Resistance =	700 Ohms
I:	Ringer Equivalence =	5.0A

■ TELEPHONE SUPERVISORY SIGNALS:

A: Dial Tone
- Type: Precision/Normal
- Frequency: 350 Hz + 440 Hz
- Level: -13dBm
- Activation: Detection of an Off-Hook condition unless a No Service condition, Lock condition, or Roam dial tone condition exists.

B: ROH Tone
- Frequency: 400 Hz (100 msec ON, 100 msec OFF)
- Level: 4.5dBm
- Activation: Enabled 45 seconds after last activity is detected on the loop if SEND command has not been issued.

C: Lock Tone
- Frequency: 350 Hz (Steady Tone)
- Level: -13dBm
- Activation: Detection of an Off-Hook condition when the transceiver is in the Lock mode.

D: No Service Tone
- Frequency: 620 Hz (Steady Tone)
- Level: -13dBm
- Activation: Detection of an Off-Hook condition when the transceiver is in No Service mode.

E: Roam Dial Tone
- Frequency: 440 Hz + 620 Hz
- Level: -13dBm
- Activation: Detection of an Off-Hook condition when the cellular transceiver is in Roam mode and the Roam dial tone option has been selected.

■ TELEPHONE DIALING FORMAT:

A: Pulse Dialing = 10 to 20 Pulses Per Second (PPS)
(Make to Break Ratio = 6)

B: DTMF Dialing =

1:	697 Hz + 1209 Hz
2:	697 Hz + 1336 Hz
3:	697 Hz + 1477 Hz
4:	770 Hz + 1209 Hz
5:	770 Hz + 1336 Hz
6:	770 Hz + 1477 Hz
7:	852 Hz + 1209 Hz
8:	852 Hz + 1336 Hz
9:	852 Hz + 1477 Hz
0:	941 Hz + 1336 Hz
*:	941 Hz + 1209 Hz
#:	941 Hz + 1477 Hz

TIMING = 25 msec ON 25 msec OFF

■ CELLULAR TRANSCEIVER INTERCONNECTION:

A: MaxJack III Connector Type = 25 Position D-Type Subminiature
B: Transceiver Connector Type = 25 Position D-Type Subminiature

PCE

■ ELECTRICAL:

General:

DC Fuses =	2AG, 1.5 Amp (MaxJack Interface)
	2AG, 4 Amp (Transceiver Ignition Sense)
	2AG, 10 Amp (Transceiver Power)

AC Version:

AC Input =	90 - 260VAC, 47 - 440 Hz
DC Output =	13.8V @ 5.4A max. 75 watts continuous
AC Fuse =	2AG, 3 Amp, 250V
L.E.D. Indicators:	Green (AC Power), Red (DC Power)
AC Power Connection:	Three-Prong Jack and Modular Cord

Battery Back-Up:

Batteries =	Two 6V 10AH, Sealed Lead/Acid
Internal Battery Operation =	3 to 36 hours
L.E.D. Indicators:	Red (AC Power), Green (DC Power)
DC Power Connection:	Molex 4 position Connector

DC Version:

DC Input =	13.8V @ 3.5A max.
L.E.D. Indicators:	Green (DC Power)
DC Power Connection:	Molex 4 position Jack (mates with Molex Connector # 39 01-2045 using sockets # 39-00-0060)
Transceiver Provision:	Motorola KSX
Telephone Equipment Connection:	RJ11C Jacks
Antenna Connection:	Bulkhead TNC Connector
Operating Temperature Range:	AC = -30C to 60C (-22F to 140F) DC = -40C to 85C (-40F to 185F) Battery = -15C to 50C (5F to 122F)
Humidity Range:	Non-condensing environment

■ DIMENSIONS:

PCE Only:	2"H x 12 5/8"W x 11 3/8"L
BBU Only:	2 1/2"H x 12 3/4"W x 11 1/8"L
PCE and BBU together:	4 1/2" x 12 3/4" x 11 3/8"

■ NET WEIGHT:

PCE Only:	5 lbs.
BBU Only:	9 lbs.
PCE and BBU:	14 lbs.

■ SHIPPING WEIGHT:

PCE Only:	7 lbs. 4ozs.
BBU Only:	11 lbs.
PCE and BBU:	18 lbs.

The Telular Group, L.P. makes no warranty and will not be held responsible for any financial loss incurred as a result of any telephone accessory or ancillary equipment not functioning when connected to a Telular product. To avoid any uncertainty, it is recommended that you contact Telular to determine whether it will function properly over the cellular system. Any Telular product received and retained for 72 hours or more will be considered sold and thereafter will be subject to the terms and conditions of Telular's warranty. All Telular products carry a 12 month limited warranty and are certified by the Company to be in good working order upon delivery. See Warranty for exact details.

The contents of this manual have been reviewed for accuracy and completeness at the time of publication. No responsibility is assumed should any portion be inaccurate. Specifications and information within this manual are subject to change without notice.

If you have any questions, discovery of errata, or comments concerning the installation or operation of the PCE, please feel free to contact us, thereby allowing us to provide better service to our valued customers.

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Rev. 01

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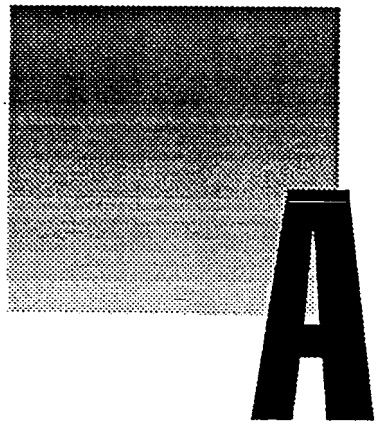
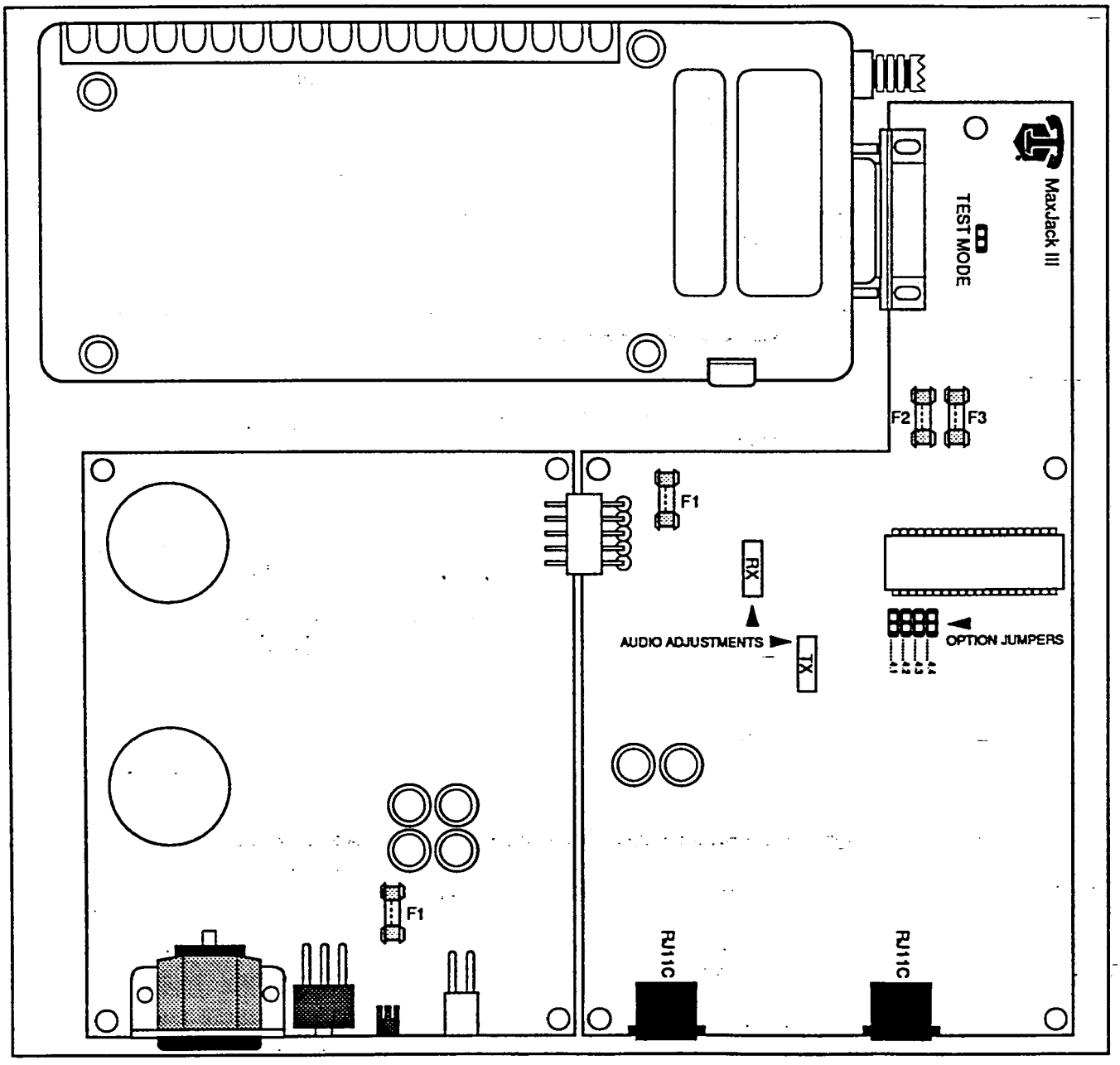
Appendix



A

- Refer to this illustration when attempting to program the transceiver, modify the jumper option settings, or when trouble-shooting the **PCE** unit. The diagram indicates the relative position of the **PCE's** basic components and will simplify identification of cabling and make instructions easier to follow.



APPENDIX A

PROGRAMMING PROCEDURE FOR MOTOROLA CELLULAR TRANSCEIVER

CAUTION: Make sure power is removed from the equipment and that the power switch is in the "OFF" position before attaching the programming handset to the cellular transceiver. Failure to do so may result in damage to the equipment or improper operation during the following procedure.

- Remove the plastic cover from the RJ-45 jack on the side of the cellular transceiver (located on the transceiver side that faces the MaxJack III interface).
- Connect the programming handset to the transceiver by inserting the RJ-31 connector on the end of handset cable into the RJ-45 jack on the transceiver.
- Connect the AC power cord to the appropriate jack on the bottom of the PCE unit. Plug the other end into a grounded AC outlet.
- Turn on the power switch. After three seconds both the red (AC) and green (DC) L.E.D.s should illuminate.
- Press the "PWR" button on the handset and wait for the "wake-up" tone. Enter the appropriate sequence.

NOTE **If either of the power indicators do not illuminate, refer to Appendix C, Troubleshooting.**
The following steps must be performed within 10 seconds following the "wake-up" sequence. It is suggested that the following steps be thoroughly read before attempting the procedure.

To enter the programming mode, the following sequence of key presses must be entered: "FCN" + "0" + Six Digit Security Code TWICE + "RCL"

NOTE **If the transceiver has not been previously programmed, the Six Digit Security Code is programmed at the Motorola factory as "000000".**

Examples:	If the Six Digit Security Code is "123456": Press "FCN" + "0" + "123456" + "123456" + "RCL" or "(FCN)0123456123456(RCL)"
	If the transceiver has not been previously programmed: Press "FCN" + "0" + "000000" + "000000" + "RCL" or "(FCN)0000000000000(RCL)"

If the sequence has been properly executed, the handset will display "01".

NOTE **If a digit is entered incorrectly during programming, press the "CLR" button and start again.**

If the entry was incorrect and/or it took too long to enter the code sequence, press "CLR" and try again.

The parameters programmed can be checked by simply scrolling through the main menu using the "*" key. Any mistake can be corrected by retyping the correct number/code.

At the end of this appendix is a worksheet which may be used to record all the information needed to program the transceiver.

06: GROUP ID MARK (GIM)

- Press "*". The handset will display the previously entered Group ID Mark.
  If the transceiver was not previously programmed, the handset will display "00".
- Enter the Group ID Mark, which can be obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "07".

07: SECURITY CODE

- Press "*". The handset will display the previously entered Security Code.
  If the transceiver was not previously programmed, the handset will display "000000".
- Enter the Six Digit Security Code determined by the user.
  This code is used to access some special features of the cellular phone.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "08".

08: UNLOCK CODE

- Press "*". The handset will display the previously entered Unlock Code.
- Enter the four-digit Unlock Code determined by the user.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "09"

09: INITIAL PAGING CHANNEL (IPCH)

- Press "*". The handset will display the previously entered IPCH.
  If the transceiver was not previously programmed, the handset will display "0334".
- Enter the IPCH, which can be obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "10".

01: SYSTEM IDENTIFICATION NUMBER (SID)

- Press "*". The handset will display the previously entered System ID Number. If the transceiver was not previously programmed, "00000" will be displayed.
- Enter the System Identification Number. This number can be obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "02".

02: CELLULAR AREA CODE

- Press "*". The handset will display the previously entered Cellular Area Code. If the transceiver was not previously programmed, "111" will be displayed.
- Enter the Cellular Area Code. This is the first part of the phone number obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "03".

03: CELLULAR PHONE NUMBER (MIN)

- Press "*". The handset will display the previous entered phone number. If the transceiver was not previously programmed, "111-0111" will be displayed.
- Enter the Cellular Phone Number assigned by the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "04".

04: STATION CLASS MARK (SCM)

- Press "*". The handset will display the previously entered SCM.
- Enter the Station Class Mark. This number can be obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "05".

05: ACCESS OVERLOAD CLASS (AOC)

- Press "*". The handset will display the previously entered AOC. If the transceiver was not previously programmed, the handset will display "00".
- Enter the Access Overload Class, which can be obtained from the cellular carrier.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "06".

NOTE **The following entry consists of six digits. Each digit represents a different option and can be either a "1" (enabled) or a "0" (disabled). To change any one option, the entire six digit code must be entered.**

10: OTHER OPTIONS

- First Digit: Internal Speaker - must be enabled if an external speaker is used with the cellular phone. Should be disabled ("0").
- Second Digit: Local Use Option - Obtained from the cellular carrier. Normally enabled ("1").
- Third Digit: Min Mark Option - Obtained from the cellular carrier. Normally disabled ("0").
- Fourth Digit: Auto Recall - Always disabled ("0").
- Fifth Digit: Second Telephone Number - for dual NAM phones. Normally disabled ("0").
- Sixth Digit: Space Diversity Reception - one or two antennas. Normally disabled ("0").
- Press "*". The handset will display the previously entered option code.
- Enter "010100"~ if the options desired correspond with settings described above.
- Check the number displayed in the handset to insure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "01".

The programming of the transceiver is now complete. Press "SND" to save the programming information in the transceiver's NAM and exit the programming mode.

11: OTHER OPTIONS

- First Digit: Motorola Enhanced Scan - Provides improved performance in areas where multiple signalling channels are present. Should be enabled ("1").
- Second Digit: Long Tone DTMF - Increases the duration of DTMF tones, enabling some low-tier telephone equipment to be accessed via a cellular telephone. Normally enabled ("1").
- Third Digit: Transportable Internal Ringer/Speaker - Routes audio to the accessory speaker. Normally disabled ("0").
- Fourth Digit: Eight Hour Timeout - Telephone feature to ensure that batteries will not be completely drained, if telephone is inadvertently left on. Always disabled ("1").
- Press "*". The handset will display the previously entered option code.
- Enter "1101"~ if the options desired correspond with settings described above.
- Check the number displayed in the handset to ensure it was entered correctly.
- If the number was entered incorrectly, press "CLR" and re-enter the number.
- Press "*" to save the entered data. The handset will display "01".

The programming of the transceiver is now complete. Press "SND" to save the programming information in the transceiver's NAM and exit the programming mode.

MOTOROLA TRANSCEIVER PROGRAMMING WORKSHEET

Line # _____ Transceiver SN _____

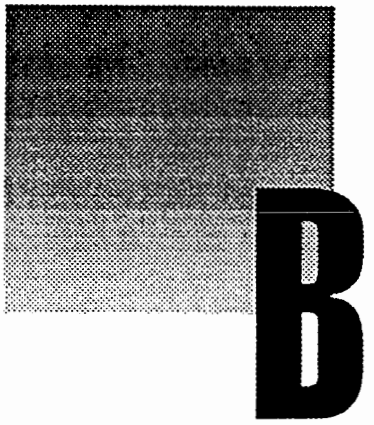
Model # _____ Transceiver ESN _____

NOTE Some of the following parameters require more digits than the Cellular carrier provides. For example, Item 09 (Initial Paging Channel) requires four digits, while the cellular carrier will only provide three digits. In cases like this, the unused leading digits must be padded with "0". For instance, if the cellular carrier tells you that the Initial Paging Channel is "333" then "0333" must be entered for that item during programming.

Item		Source
01	System ID Number (SID)	Cellular Carrier ☐☐☐☐
02	Cellular Area Code	Cellular Carrier ☐☐☐
03	Cellular Telephone Number (MIN)	Cellular Carrier ☐☐☐☐☐☐☐
04	Station Class Mark (SCM)	Cellular Carrier ☐☐
05	Access Overload Class (AOC)	Cellular Carrier ☐☐
06	Group ID Mark (GIM)	Cellular Carrier ☐☐
07	Security Code	User ☐☐☐☐☐☐
08	Unlock Code	User ☐☐☐☐
09	Initial Paging Channel (IPCH)	Cellular Carrier ☐☐☐☐
10	Options	0 ☐ ☐ 0 0 0
	Internal Speaker	Disabled
	Local Use Option (L.U.)	Cellular Carrier
	MIN Mark Option	Cellular Carrier
	Auto Recall	Disabled
	Second Telephone Number	Disabled
	Space Diversity Reception	Disabled
11	Options	1 1 0 1
	Motorola Enhanced Scan	Enabled
	Long Tone DTMF	Enabled
	Transportable Internal Ringer/Speaker	Disabled
	Eight Hour Timeout	Disabled

NOTE SAVE THIS SHEET!! The Security Code and Unlock Code are very important, and may be needed in the future. The other information on this worksheet may be useful if the cellular transceiver fails to operate properly.

Appendix



B

There are a number of factors to consider when selecting the type of antenna and antenna placement location. A few of the factors include:

- the distance to the nearest cell site
- the degree of down-tilt used on the cell site antenna array
- the type of terrain and foliage between the antenna and cell site
- the existence of man-made obstacles such as buildings and/or water towers between the antenna and cell site
- the distance between the **PCE** and the antenna placement
- the height of the antenna above ground level
- the type and length of cable used to attach the antenna to the **PCE**

The factors mentioned above can be addressed by following a few basic antenna selection and installation guidelines:

- Know the location(s) of the closest cell site(s). The cellular carrier can provide the appropriate location information. This information will assist you in directionalizing antennas and enable you to do a path check between the cell site and your location for any man-made or natural obstacles.

- Man-made and natural obstacles such as buildings, water towers, mountains, hills and trees can cause the cellular signal to deteriorate or even block the signal. Raising the antenna, relocating the antenna, or choosing a higher gain antenna may enable a high quality connection to be established.

- The antenna should be placed as close to the **PCE** as possible when beginning to evaluate possible locations. If a high quality connection is not possible in close proximity to the **PCE**, then different placement locations should be tried. Depending upon signal strength, the antenna may need to be mounted external to the building.

- The type and placement needs of the antenna can vary significantly over a small distance (as little as a few feet horizontally and/or vertically), so different antenna placement locations should be tried if a high quality connection between the cellular system and the **PCE** is not established.

- Always elevate the antenna as high as possible so that it has as clear a path to the cell site as possible.

- If the installation location is well within the range of the cell site, a unity gain antenna or a 3 dB gain antenna should be sufficient for a quality cellular connection. However, if the installation is on the "fringe" or just outside the range of the cell site, a higher gain, directionalized antenna may be needed to establish an acceptable connection.

- It is important that the proper type and length of cable is used to connect the antenna to the cellular transceiver. The cable should be laid as straight as possible with no kinks, twists or bends. If the cable has to be coiled, keep the radius of the coils as large as possible.

APPENDIX B

ANTENNA INSTALLATION INSTRUCTIONS

WARNING: TO PREVENT DAMAGE, SERIOUS INJURY, OR EVEN DEATH, NEVER MOUNT AN ANTENNA NEAR HIGH VOLTAGE POWER LINES. FURTHER, TELULAR RECOMMENDS LIGHTNING PROTECTION FOR ALL EXTERIOR ANTENNA INSTALLATIONS.

■ Overview

The type of antenna and quality of the antenna installation are critical elements in determining the clarity and reliability of the cellular signal transmission and reception between the PCE and the cellular system. The circumstances of any given installation need to be carefully considered to achieve optimal antenna placement.

Prior to discussing the various factors to consider in an antenna placement, a few facts concerning antennas may be useful.

One of the identifying characteristics of an antenna is it's "gain". Some of the terms you will run into are "unity gain", "3 dB gain", "9 dB gain", etc. A brief explanation of these terms is necessary.

Antennas are NOT capable of amplifying an RF signal. However, they can be designed to concentrate the radiated power in a specific pattern or direction. In this way, the range of the transmitter can be increased, since the transmitted power is concentrated in useful directions.

The gain of an antenna is a figure that is referenced to a true omni directional antenna. This type of antenna radiates the transmitted power in all directions. If the radiated power was visible, it would look like the antenna was surrounded by a globe. This type of antenna is referred to as a "unity gain" antenna.

An improvement over the "unity gain" antenna is the "3 dB gain" antenna. This antenna is also "omni-directional", but the transmitted power is concentrated in the horizontal plane instead of being wasted in the vertical plane. Because of this RF power concentration, a 3-watt transmitter would have the range of a 6-watt transmitter using a "unity gain" antenna, or an Effective Radiated Power (E.R.P.) of 6 watts

Doubling the E.R.P. DOES NOT double the range!

For a fixed installation, a directional antenna may be desired. This type of antenna concentrates the transmitted power in the direction it is pointed. These antennas can be designed to have a wide "beam-width" or a narrow "beam-width". The narrower the "beam-width", the higher the gain of the antenna.

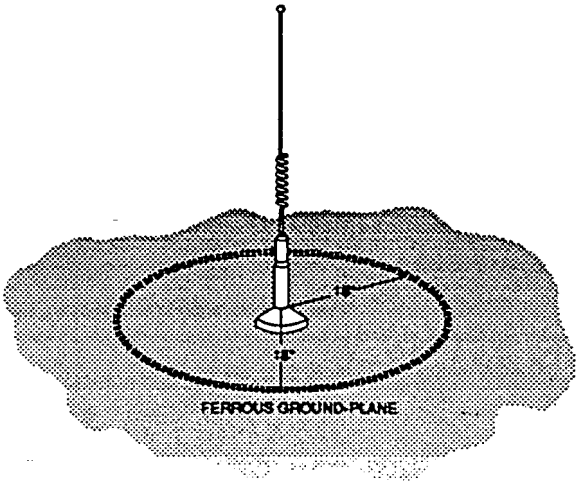
It is critical that directional antennas be pointed directly at the cell site. The direction of the nearest cell site can be determined by contacting the cellular carrier for your area.

Telular offers a 9 dB gain Yagi antenna with cable and a 12 dB gain Yagi antenna with cable. The cable types and lengths supplied by Telular with our Yagi antennas are calculated to provide the maximum E.R.P. allowed by FCC regulations and EIA standards.

MA 1000 3 dB GAIN MAG-MOUNT ANTENNA

Your magnetically mounted (mag-mount) antenna comes assembled with 12 feet of RG58A/U coaxial cable which has a male TNC connector. Connect the antenna to the appropriate connector on the **PCE** unit. Ensure that the connector is inserted fully and hand tight.

Place the antenna VERTICALLY on a ferrous metal surface (ground plane) in a location so that it's perimeter is clear of any metal objects and/or obstacles. This metal base must be large enough to cover an area which is at least 18 inches in all directions from the antenna.

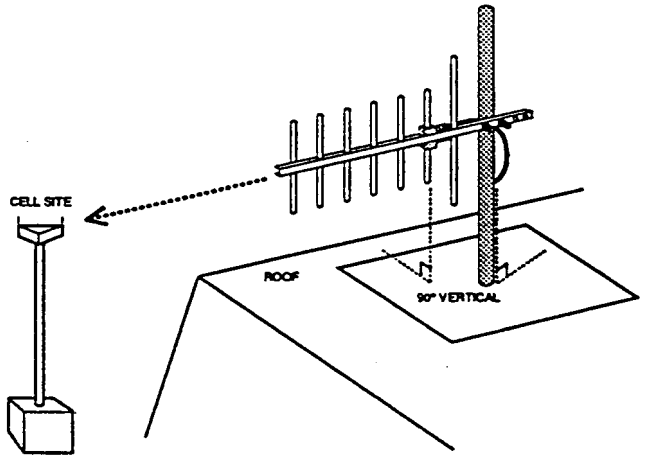


To install this antenna, find out the location of the closest cell site servicing your area.

- The FA-1000, 9 dB YAGI antenna comes assembled with 17 feet of RG58A/U coaxial cable which has a male TNC connector.
- The FA-1200, 12 dB YAGI antenna comes assembled with 45 feet of RG58A/U coaxial cable which has a male TNC connector.

DIRECTIONAL ANTENNAS

Connect the antenna to the appropriate connector on the **PCE** unit. Ensure that it is inserted fully and hand tight. Point the antenna towards the cell site. Make sure the elements (the bars on the antenna) are positioned vertically. It should be in a location so that the transmission path is clear of any nearby metal objects and/or obstacles.



- The antenna and cable should be as far away from any other transmission sources as possible to minimize potential interference from those sources. Other transmission sources include other antennas, radio frequency (RF) generators and AC power lines.

- If attempts to establish a high quality connection are unsuccessful, relocation of the entire installation may be necessary. Prior to moving the entire installation, attempt to access a different cell site through the use of a directionalized high gain antenna. Even though the cell site may be farther away, the different direction may avoid man-made or natural obstacles that are blocking the cellular signal.

- Remember, that while the distance that the **PCE** unit can be from the antenna is limited, the distance from **PCE** to the telephone equipment to which it is connected can be upwards of 2,000 feet or more. Thus, the **PCE** does not have to be collocated with the telephone equipment to function appropriately. This aspect of the equipment gives significant additional flexibility in the installation process.

- No matter what type of antenna is being used, propagation patterns vary as does reception. You may want to try different locations to achieve the best results, even if a given location appears adequate. Once the best antenna type and location is determined, permanently mount the antenna.

For use with alarm systems, the antenna should always be mounted inside the building within the perimeter of the alarm's protection.

Appendix C

2. Turn the power switch ON. The red and green LEDs should illuminate after 3 seconds. If they do, proceed to step "3"; if not, turn the power switch OFF, unplug the unit and:

- Make sure the AC power outlet and the corresponding circuit breaker are functioning properly. This is easily checked by plugging any electrical device (lamp, clock, radio, etc.) into the same outlet.
- Check the power cord connection between the AC power outlet and the **PCE** unit. Make sure the cord is firmly seated at both ends.
- Check the AC fuse "F1" on the power supply module (see above figure for location).
- If the PCE will not power up properly after completing the above checks and correcting any deficiencies, call Telular Technical Support.

3. If this PCE is configured with a Battery Backup Unit proceed with this section; if not go to step 4.

- Turn OFF the power switch and unplug the PCE. Turn the power switch ON and push the "Battery Start" switch momentarily. The green LED should illuminate. If it does not, turn all switches off and call Telular Technical Support.
- If the green LED does illuminate in the previous step, turn the power switch OFF and plug in the **PCE** unit. Turn ON the power switch. In case the green and red LEDs turns on, rock the power switch ON and OFF several times to insure consistent operation. Remember that there is a three second delay after turning on the switch before the LEDs turn on. If operation is consistent, proceed to step "4".
- If operation is not consistent or the green and red LEDs do not illuminate, turn the power switch off, unplug the **PCE** unit, and call Telular Technical Support.

4. Pick up the telephone and listen for normal dial tone. If dial tone is heard go to step "5". If no dial tone is heard, do the following steps:

- If a tone other than normal dial tone is present, refer to the Features section, pages 10 and 11, for a description of the other tones the MaxJack interface produces.
- Check jumper 4.2 (Loop Start/Ground Start). Refer to the User Selectable Options section, page 13 for details.
- Check all the fuses in the PCE. Using the provided spare fuses, replace any blown and/or damaged fuses.

If all of these steps are executed and there is still no dial tone, call Telular Technical Support.

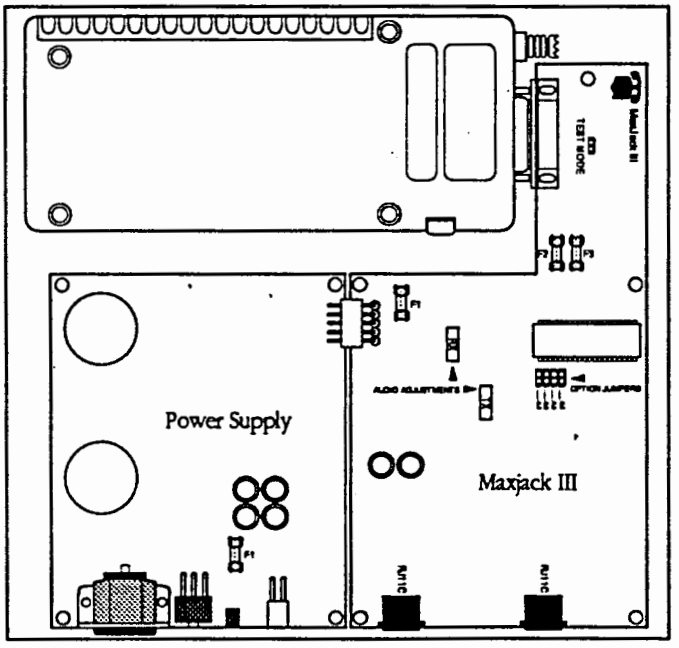
APPENDIX C

GENERAL TROUBLESHOOTING

■ OVERVIEW

The information contained in this appendix is not intended to be a comprehensive technical service source. Rather, the information is provided to assist the user in identifying and correcting some minor operational issues that may occur during the life of the **PCE** unit or during installation. The information assumes a thorough familiarity with the main sections of the Owner's Manual and references various sections within the Manual. In the event of a failure to resolve any operational issues after consulting this appendix and other information in this Owner's Manual, additional assistance is available through Telular's toll-free Technical Support group number, 800-333-8899, if you are in the U.S., or if outside the U.S., dialing 708-256-8000.

When contacting Telular's Technical Support group, please have appropriate information readily available concerning date of **PCE** purchase, number of lines affected, any observed symptoms and corrective measures attempted to date, type of equipment to which the **PCE** is connected, the types of option settings which may have been made to the MaxJack interface boards and the software version of the board (this can be ascertained by looking at the top of the interface board when the enclosure is opened), and the transceiver type, serial number and the programming worksheet completed at the time of installation. Technical Support personnel may ask for additional information if the situation warrants.



Maxjack III
F1= MaxJack Power Fuse
F2= Transceiver Power Fuse
F3= Ignition Sense Fuse

Power Supply
F1= AC Power Fuse

Connect an antenna, telephone, and the AC power cord to the cabinet (See Installation).

1. Make sure the power switch on the PCE is in the OFF position.

5. Dial an existing telephone number to see if the cellular connection can be made. If the cellular system returns with a "system reorder" tone (similar to a busy signal) after dialing the number, make sure the transceiver is "on the air". Service for the transceiver has to be turned on by the company supplying the cellular service before any calls can be made.

   Check the antenna cable and connectors from the transceiver to the antenna connector on the Telular unit. Make sure it is continuous and secure. Also check the antenna connection and connectors from the PCE cabinet to the antenna. Refer to Appendix B for information on antenna installation

   If none of these steps solve the problem, contact Telular Technical Support.

Appendix

D

APPENDIX D

APPLICATION NOTES

■ GROUND-START PBX SYSTEMS:

For ground-start PBX equipment to work properly with the **PCE** unit, the PBX and **PCE** must share a common ground. Provisions have been made for this application by connecting pins 1 and 4 of the RJ11 jacks to the chassis of the **PCE**. Since 4-wire telephone cable is readily available and widely used, simply use the yellow and/or black wires as the ground connection for the PBX. This will ensure that both pieces of equipment are using the same ground reference and will probably avoid Off-Hook detection problems. Ground-start PBX systems utilize specific software and electrical timing parameters which differ between manufacturers. Some systems are capable of being programmed to accommodate a variety of different telephone line specifications. The MaxJack's ground-start circuitry and software have been designed to accommodate major manufacturer's standard mid-range operating parameters and may not work properly with all ground-start PBX systems. Telular recommends testing and/or confirmation of compatibility prior to permanent installation. In the event that difficulty is encountered, contact Telular Technical Support.

■ PBX/KSU SYSTEMS:

The **PCE** should be connected to a PBX/KSU as a standard DID/DOD trunk line. DO NOT PARALLEL THE **PCE** LINE WITH AN INCOMING TELEPHONE COMPANY LINE. Doing so would most likely damage the interface in the **PCE**.

■ FACSIMILE MACHINES:

A facsimile machine should be connected exactly as it needs to be configured for use on a regular telephone company line. Some models of portable facsimile machines require an external telephone in order to send a facsimile transmission. These models of facsimile machines still need this external telephone when hooked up to the **PCE** unit.

■ MULTI-EXTENSION INSTALLATIONS:

For a multi-extension installation, make sure that all the extensions are On-Hook. If one extension is Off-Hook, none of the extensions on that line will ring when a call is being received.

WARRANTY REGISTRATION FORM

Please print.

Name _____

Address _____

City _____ State (Province) _____

Country _____ Zip Code _____

Telephone _____ Fax _____

Model PCE Purchase Date _____

Purchased From _____

MaxJack Serial No. _____ _____

_____ _____

Equipment Application: ☐ Voice ☐ Fax ☐ Data

Make(s) and Model(s) of Telephone Equipment being used with your **PCE:**

_____

_____

_____

24-MONTH EXTENDED WARRANTY APPLICATION: Upon receipt of this application, with proof of purchase and the appropriate monetary amount enclosed (DO NOT SEND CASH), $370.00 per line, within 30 days of the date of purchase, Telular will extend its 12 Month Limited Domestic Warranty for an additional 24 months.

Is Extended Warranty Desired? ☐ Yes ☐ No

Signature: _____ Date: _____

TELULAR
1215 Washington Avenue, Wilmette, Illinois 60091-2566 708 256 8000 Fax 708 256 35555

APPENDIX F

Specifications for Gas Venting Blower

Blower Specifications

Make:	EGE, Rotron
Manufacturer:	Seugerpies, Inc.
Model #:	DR505AS72M
Part#:	037543
HP:	2
Rating:	Constant Duty
Volts:	230 / 460 V
Phase:	1