Teldata Solutions
A National Grid Company

Field Installation Overview And Operation Manual

TDS-Short Hop

Wireless Radio Solution

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Industry Canada (IC) Notice

The Industry Canada (IC) label identifies certified equipment. Certified equipment meets telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, be sure that it is permissible to connect to the local telecommunications facility. Install the equipment using an acceptable connection method. The customer should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

A designated representative should coordinate repairs to certified equipment. Repairs or alterations made by a user to this equipment, may give the telephone communications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority.

NOTE: The **Ringer Equivalence Number** (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Number of all the devices does not exceed 5.

The REN is dependent upon the TIU used.

Contents

Overview: The Short Hop System

The TDS-Short Hop Radio System is designed to allow reading of meters that are inaccessible or uneconomical to read through a direct wire connection.

The Short Hop Radio is added to the existing telephone based system by the addition of two components to the Teldata AMR system.
The components are a receiver located on the TIU and a transmitter wired to the meter with a wire length of no more than 200' from the meter.
The distance of transmission for the Short Hop link is 150', direct line of sight, transmitting from a non-metallic lid.
The system is a one-way transmission system. The transmitter transmits readings on a timed interval basis to the receiver. The TIU then logs the readings in the receiver on its own log interval basis, independent of the transmission intervals of the transmitter.

The Receiver
The radio receiver is a daughter board that is mounted on the TIU.
To operate, the receiver requires that 12vac power be supplied to the TIU.
The receiver is programmed via an on-board program header identical to the header on the TIU.
The receiver is a four-channel device. It can pick up transmissions from four different transmitters.

The Transmitter

The transmitter is a small tubular device. It is roughly 3" long by 1 ¾" in diameter.
The transmitter can read one meter of any type output, whether pulse, switch closure or encoder.
The transmitter is a sealed potted unit with a 10-year guarantee on the battery life while transmitting once every five minutes.
Programming of the transmitter and reading the meter is accomplished via the three-conductor meter wire.

Short Hop Communications

The transmitter can send five bits of data:

- Transmitter ID number
- The meter reading
- Meter Serial Number (encoder meters)
- Battery low flag
- Tamper flag

The receiver will receive any transmission within reception range.
Each channel of the receiver allows entry of an ID number.
The ID transmitted must match the ID entered into the desired meter channel in order for the receiver to store the data in that channel.
When a match is found the received data is stored in the matching channel.
The receiver ignores any received transmissions not found to match a meter channel ID in the receiver.

Configuring the Teldata Manager Software

It is recommended that the Short Hop Radio system be run on Teldatamanger software version 5.0 or later.

The 5.0 and later versions support an additional module that smoothes data aberrations that can occur with radio data. The 5.0 and later versions of software also support newer model "radio ready" TIUs not supported in earlier releases.

These instructions assume a prior knowledge of the Teldatamanager software system.
If you are unfamiliar with the Teldatamanager software it is recommended that you read the software manual to familiarize yourself with the basic screens addressed here.

Two unique "radio specific" entries must be made in the software to allow proper operation of the short hop system.

Go to: Teldatamanager-
-Maintenance-
-Meter Types

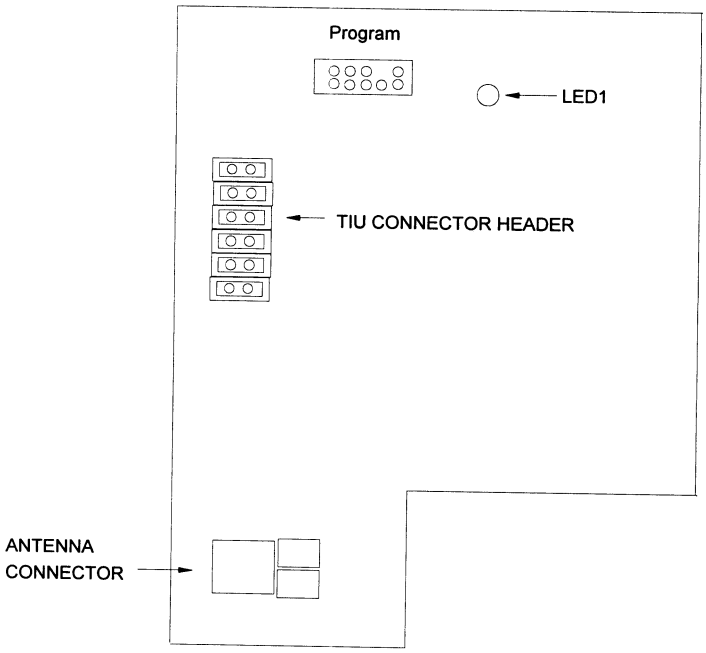
- Create a meter type.
- Select "Encoded"
- Enter 2V805 under "Logger"
- Enter 5,8,16,8 under "Read Parse"

All other entries under Meter type are selected and entered as you would with any other type of meter.

The Short Hop Receiver

The Receiver Board Layout

TDS-Short Hop Board Layout



Receiver Installation

Physical Placement

The receiver is installed as a unit with the TIU.
The receiver is electrically connected to the TIU by a plug on the receiver board that mates to a header on the TIU.
The receiver is physically held in place by posts that snap into mounting holes on the receiver and TIU.
Normal TIU installation guidelines apply for mounting the TIU.

The Coaxial Antenna

The radio receiver is equipped with a coaxial antenna that is shipped inside the enclosure.

The coaxial cable is long enough to allow you take the antenna out of the enclosure and to place the antenna in different locations if reliable reception cannot be made with the antenna immediately adjacent to the enclosure.

NOTE: The antenna must be located outside the enclosure.

The actual antenna is the section of the coax cable where the black, shielded, sheath has been stripped away.

This 9" length of "exposed " cable is the antenna.

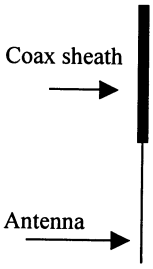
The length of the black-shielded section of cable is non-critical. You may shorten the overall length of the cable by cutting it back but you must be careful to strip a 9" end section of the remaining cable to re-create the antenna.

NOTE: The 9" inch antenna length is critical.

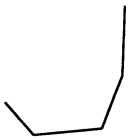
Antenna Alignment

The 9" antenna section of the cable **"MUST"** be aligned vertically. If the antenna is aligned horizontally reception will be negatively impacted.

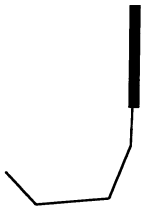
VERTICAL
YES



HORIZONTAL
NO



COILED
NO



Programming the Receiver

Insure program terminal is set at 1200 Baud

Type PRO at * (asterisk) prompt
The unit returns the following:

```
PORT1 ID=00000000
>(Enter)
PORT1 DATA=??00??00
PORT2 ID=00000000
>(Enter)
PORT2 DATA=??00??00
PORT3 ID=00000000
>(Enter)
PORT3 DATA=??00??00
PORT4 ID=00000000
>(Enter)
PORT4 DATA=??00??00
*
```

- The ports IDs are read/write fields.
- The port data are read only fields.

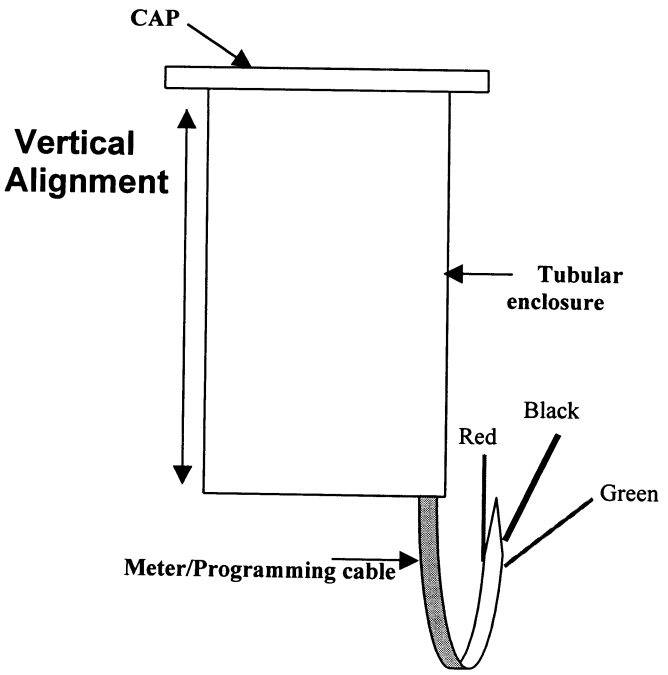
NOTE:
It is important that any port not being actively used have its ID set as eight zeros, as shown in the example above.
If there is any other numerical value entered the TIU will see this as the port being active and it will interact with the receiver port rather than it's own on-board port.
The port data fields will display garbage characters until they have received a legitimate read from a radio transmitter.
The receiver will not log an incoming transmission unless the ID transmitted with the read matches the ID in the Port of the receiving unit.
When the board is receiving a transmission a Buzzer or an LED that can be connected to a two-pin header on the receiver board can indicate the reception either audibly or visually.

The Short Hop Transmitter

Physical Placement

The transmitter is packaged in a tube with the antenna located at the top of the tube.
There is a cap on the enclosure that identifies the top of the tube. The cap has edges that extend beyond the outside diameter of the tubular body of the transmitter.
The edges of the cap allow the transmitter to be mounted through the top of a pit lid that has a hole drilled for the tube to extend through. The transmitter's tubular enclosure must be installed vertically as it is when placed through a meter pit lid even where the transmitter is not installed in a meter pit lid.

SEE BELOW:



All three conductors of the meter/programming cable are used in both programming the transmitter and in reading encoded meters.
When connecting to pulse or switch output meters only two of the wires are used.

The color codes and the corresponding function for the conductors are listed below.

RED = Clock BLACK = Ground GREEN = Data

Connecting to Encoders

Connection to encoding meters varies with manufacturer. Some commonly encountered types are listed below:

Meter Type	(R) RED	(B) BLACK	(G) GREEN
Sensus ECR (Gas & Water) Landis & Gyr	R	B	G
Sangamo T2000 Schlumberger ARBIII-V	B	G	R
Kent Scancoder	G	B	R

Connecting to Pulse Initiators

Pulse Initiators include solid-state switches, metallic contact switches, and voltage pulses.
Pulse output meters connect to the B and G wires on each meter port (B = negative, G = positive).
The RED wire should be left un-terminated

Programming The Transmitter

Insure the program terminal is set at 1200 Baud

Type PRO at * (asterisk) prompt

The unit returns the following: (see the following page)

ID # (8 DIGIT) ***ID must match ID in receiver port***
= 00000000
>(Enter)
Meter Type ***See below for additional instructions***
= *nnnnn*
>(Enter)
TRX FREQUENCY (HH:MM) ***Max frequency = 07:59***
= *HH:MM* ***To disable enter 00:00***
>
*

NOTE: The Meter Type codes for the Pit transmitter are identical to those used in the TIU port control string minus the read profile two digit prefix.

EXAMPLE: P0000 = Pulse/Switch meters

2V605 = Sensus Six Wheel encoder

3F602 = ARB Six Wheel encoder

5K602 = Kent Six Wheel encoder

NOTE: See Page 17 for more examples!

If an encoder meter is selected the following script will appear:

ID AUTO DOWNLOAD? (Y OR N)
= N (N for no download of the encoder ID is the default)
➢ (enter Y for download of the encoder ID if desired)

The auto download function instructs the transmitter to transmit the encoder ID on the FIRST transmission. The receiver will store the ID.

If a pulse meter is selected the following script will appear:

DELAY SEC (2 DIGITS)
= 30 (factory delay before counting pulses = 30 seconds)
➢ (enter new delay time if desired)

The delay in seconds before counting pulses allows the installer time to disconnect the programmer and connect the pulse leads without inadvertently injecting spurious pulses into the transmitter.

The Pulse Accumulation Register

Access the register using the @M01 command.
An eight-digit entry is required, use leading zeros.

@M0100000000 = sets the register to zero

@M01 (enter) = displays the current number of pulses stored in this register.

Setting The Clock

Access the clock using the @T command. The clock format is (HH:MM:SS).

@T12:30:30 = sets the clock to 30 minutes and 30 seconds after 12:00 noon

@T (enter) = displays the current time

Changing Pulse Values

Manually changing the pulse total contained in the RF transmitter pulse accumulator involves entering the proper memory access code, **@M01** followed immediately by the desired new eight-digit pulse total. You **must** enter a full eight-digit number including any leading zeros.

Example 1 - Change pulse accumulator to 1234:

***@M0100001234 (Enter)**

*

Example 2 - Clear pulse accumulator to 0:

***@M0100000000 (Enter)**

*

Teldata recommends that whenever you complete a change you examine the particular pulse accumulator to verify the result.

Field Correlation of Pulse Totals to Meter Faceplate Reading

Correlation of the accumulator pulse totals to a meter's faceplate reading involves retrieval of the particular meter's pulse accumulator pulse total and multiplying it by the pulse constant.

Example 1 - A single-phase electric meter is equipped with a Teldata Model RS-1 disk rotation sensor that produces one pulse for each complete rotation of the meter disk. The meter's Kh is 7.2 watt-hours per disk rotation, which corresponds

to 7.2 / 1,000 disk rotations = .0072 kWh per disk rotation. The pulse value for this installation is .0072 kWh per pulse.

TRANSACTION	DESCRIPTION
***@M01 (enter)**	First access the pulse total
00732485	
*	

Note: The @ symbol is an activation character only and does not display.

Now multiply this pulse total by the pulse value:
00732486 x .0072 = 5273.892KWH
the meter faceplate should read between 5273 and 5274.

Example 2 - The RS-1 equipped meter in the prior example has a faceplate reading of 00785. The installer wishes to set a pulse total corresponding to this faceplate reading into the transmitter pulse accumulator.

Step 1 Divide the meter's faceplate reading by the pulse value to obtain the equivalent pulse total according to the formula on the next page.

$$\text{PULSE VALUE} = \frac{\text{C/T*factor X Kh}}{\text{PULSE RATE X 1000}}$$

therefore:

faceplate reading / pulse value = pulse total
785 divided by .0072 = 109028 pulses
Step 2 Convert this pulse total to an eight-digit integer form and add leading zeros: pulse total = 00109028

TRANSACTION	DESCRIPTION
Step 3	
***@M0100109028 (Enter)**	Program TDS-2 Meter
*	Port #1 pulse accumulator
Step 4	
***@M01 (Enter)**	Review programming
00109028	Present reading
*	

As a final check, multiply this pulse total by the pulse value to double check the entire process:
00109028 x .0072 = 785.0016

The faceplate reading of 785 is now verified.

Appendix A:
Field Pro - Operations Manual

TIU Programming Terminal
Function Keys

1	Escape ESC - facilitates a quick return to the * prompt.
2	Back-space during an entry to correct a mistaken key stroke
CTRL SHIFT+F1	Change the data communications parameters.
5	Save the data communications parameters.

Connection to the TIU

If possible, connection to the TIU programming port should be made before the terminal is turned on.
Connect the cable from the terminal to the ten pin port on the TIU labeled **PROGRAM**.

Attachments

The charger connects to the side of the 9 pin adapter, located between the blue ribbon cable and the coiled modular cord.

Power Saver

The terminal will turn itself off if no characters are received and no keys are pressed for 10 minutes. The terminal can be restarted by pressing the ON/OFF button.

Battery

Operating time on a full charge is up to 48 hours of continuous use. To maximize the life of the NiCad battery pack the batteries should periodically be allowed to discharge completely. Charging the internal battery requires 16 hours of charging time if the battery is fully depleted. Re-charging must be done with the terminal turned off.

Glossary

AMR Automatic Meter Reading - remote capture and transmission of consumption data.

Alert tone A tone sent by the central computer over the telephone line. This tone is sent when the utility has called its customer and the customer or an answering machine has answered the call. If no one answers the phone the utility will ring the telephone line for the ring count and hang up. In either case the TIU will call the central computer.

ASCII American Standard Code for Information Interchange - an industry standard for the binary encoding of characters.

baud a measure of transmission speed over an analog telephoneline. TIUs transmit at 300 or 1200 baud.

index the meter register on a gas meter

initial The pulse count displayed on the face of a pulse generating count meter at the time the TIU is installed. The initial count is programmed into the TIU.

ITU-T International Telecommunications Union, an international standards organization that focuses on common practices and policies in telecommunications. Previously known as CCITT.

Measured Also known as usage sensitive pricing - a local service phone company method of pricing used to bill local phone calls. Measured service is often charged on the number of calls, the time of day, the distance traveled and the length of the call.

Meter A device attached to a utility meter that displays the current register read.

Meter Serial # Usually an 8 digit number programmed into the meter register by the manufacturer and returned in the data stream from an encoded meter through the TIU to the software.

Settings for Switch Closure/Pulse Registers

Meters	Byte 3	Byte 4 & 5	Byte 6 & 7
NOTE: This setting allows the TIU to filter out any pulses with a value greater than that set by bytes 6&7.	Teldata meter ID	Bytes 4 & 5 are not used	Length of time the pulse is in the Low State (switch in the **on state).** 2 numeric digits indicate the number of ticks. Each tick represents 10 milliseconds. For example: 02 = 20 milliseconds 04 = 40 milliseconds (00 = default to 20 ms)
Switch/Pulse Output Meters			
Teldata RS-1	P	00	02
Gas with Riotronics	P	00	99
Sprague 400	P	00	99
Sprague S1A	P	00	99
Rockwell 175	P	00	99

Settings for Encoded Registers

	Byte 3	Byte 4	Byte 5	Byte 6 & 7
	Set Digit by Teldata.	Start Character in the datastream		Number of digits read including the start character (Byte 3) before the meter read begins
Encoded Registers				
Water				
Sensus 4 wheel encoded register	2	R	4	02
Sensus 6 wheel encoded register	2	V	6	05
Equimeter 4 wheel gas index	2	R	4	02
Kent 6 wheel encoded register	5	K	6	02
ARB 4 wheel encoded register	3	E	4	02
ARB 6 wheel encoded register	3	F	6	02
ARB 6 (Pro Read)	2	R	6	02
Electric				
Landis & Gyr DEMS				

TIU Telemetry Interface Unit - a component of an AMR system. The TIU reads consumption data from gas, water and electric meters installed at remote locations and transmits this data over the telephone line to the computer.

PB-01 Pulse Board Model 01. A PB-01 accepts pulse inputs from all types of utility meters with pulse output registers including pulse generators and dry or solid state switch closure. One or more PB-01s can be mounted on a Teldata Solutions TIU, Model IE-4.

port A hardware location for passing data in and out of a computing device. TIUs have 6 ports - 4 for utility meters, 1 for the telephone line, and 1 for an ASCII terminal.

pulse dialing Rotary style dialing as opposed to touch tone.

ring count The number of telephone rings necessary to signal an TIU to call the central computer (1 to 99).

RS232C An industry standard for serial communication connections.

serial port A hardware location for sending and receiving serial data transmissions.

SQL Structured Query Language (abbreviated SQL and commonly pronounced *sequel*) is the standard language for storing and manipulating data in relationship databases.

Touch tone Keypad type dialing that sends DTMF tones over the telephone line. Tone dialing

Warranty

Teldata Incorporated warrants that all equipment sold pursuant to any resultant agreements shall be free from defects in material or workmanship at the time of delivery. Such warranty shall extend for one year. Buyer must provide notice to Teldata Incorporated within this prescribed warranty period of any defects: if the defect is not the result of improper usage, service, maintenance or installation and equipment has not been otherwise damaged or modified after delivery, Teldata Incorporated shall either replace or repair the defective part or parts of equipment or replace the equipment or refund the price at Teldata Incorporated's option after return of such equipment by buyer to Teldata Incorporated

Shipment to Teldata Incorporated facility shall be borne on account of buyer, including all duties, fees, brokerage and special handling charges. Shipment from the Teldata Incorporated facility shall be borne by Teldata Incorporated.

(a) Consequential Damages - Teldata Incorporated shall not be liable for any incidental or consequential damages incurred as a result of any defect in any equipment sold hereunder and Teldata Incorporated's liability is specifically limited to its' obligation described herein to repair or replace a defective part or parts covered by this warranty.
(b) Exclusive warranty - The warranty set forth herein is the only warranty, oral or written made by Teldata Incorporated and is in lieu of and replaces all other warranties, expressed or implied, including the **WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

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December 4, 2000

This equipment has been te4sted and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protections against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that inference will not occur in a particular installation. If this equipment does cause harmful inference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the fallowing measures:

*Reorient or relocate the receiving antenna.

*Increase the separation between the equipment and receiver.

*Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

*Consult the dealer or an experienced radio/TV technician for help.

This equipment has been verified to comply with the limits for a Class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment; Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacture could void the user's authority to operate the equipment.