NOTICE:

Any operation involving work on pipelines containing gases or liquids under pressure is potentially hazardous. It is necessary, therefore to follow correct procedures in the use of this equipment to maintain a safe working environment.

No person should use this equipment unless fully aware of potential hazards of working with pressurized pipelines and trained in the procedures stated in this manual.

The purchaser of this equipment is responsible for the training and competence of the operators and the manner in which it is used.

Contact CDI immediately should any difficulty arise in the use of this equipment.
# Table of Contents

NOTICE: ........................................................................................................... 2  

TABLE OF CONTENTS......................................................................................... 3  

INTRODUCTION........................................................................................................ 5  

POWER OPTIONS .................................................................................................. 5  

- TEMPERATURE REQUIREMENTS ................................................................. 5  
- BATTERIES ......................................................................................................... 6  
- D-CELL BATTERY INSTALLATION ................................................................. 6  
- BATTERY USER SETTINGS ............................................................................... 7  
- +24 VDC USER SETTINGS ................................................................................ 8  
- USER SETTINGS ................................................................................................ 8  
- +24 VDC & SCADA CONNECTIONS ............................................................... 9  

DETECTION METHODS ....................................................................................... 11  

- PERMANENT MAGNETS ................................................................................. 11  
- MAGNETIC TRANSMITERS ........................................................................... 13  

THE USER INTERFACE ......................................................................................... 14  

1) PASSAGE TIME / CURRENT TIME ................................................................. 14  
2) PASSAGE DATE / CURRENT DATE ............................................................... 14  
- RECENT PASSAGE INDICATOR ...................................................................... 15  
- DISPLAYED PASSAGE INDICATOR ............................................................... 15  
- ACTIVE FUNCTION INDICATORS ................................................................. 16  
- DISPLAY ROTATION ...................................................................................... 16  
- THE BANDIT’S INTERFACE LEVER ............................................................. 17  
- MOST RECENT PIG PASSAGE DISPLAY ...................................................... 18  
- REAL TIME DISPLAY ..................................................................................... 19  
- PREVIOUS PIG PASSAGES .......................................................................... 19  
- CLEARING THE “RECENT PASSAGE” FLAG .............................................. 20  
- SETTING THE CLOCK .................................................................................. 21  

OPTIONAL EQUIPMENT .......................................................................................... 23  

- PORTABILITY (TRIGGER SUSPEND) ............................................................. 23  
- REMOTE INDICATOR SYSTEM (RIS) .......................................................... 24  
- HEATER SYSTEM ............................................................................................ 25  
- HEAT RISERS ................................................................................................. 25  

INSTALLATION .................................................................................................... 26  

- STEP 1: PREP BANDING ............................................................................... 26  
- STEP 2: ATTACH BASE ................................................................................. 26  
- STEP 3: TIGHTEN TENSION ......................................................................... 27  
- STEP 4: CUT EXCESS ................................................................................... 27  
- STEP 5: SECURE BUCKLE ........................................................................... 28
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARRANTY AND SERVICE OF EQUIPMENT</td>
<td>30</td>
</tr>
<tr>
<td>MAKING A WARRANTY CLAIM</td>
<td>30</td>
</tr>
<tr>
<td>CARE AND MAINTENANCE</td>
<td>30</td>
</tr>
<tr>
<td>SERVICE REPAIRS AND MAINTENANCE</td>
<td>31</td>
</tr>
<tr>
<td>SYSTEM SPECIFICATIONS</td>
<td>34</td>
</tr>
<tr>
<td>MAGNET MOUNTING OVERVIEW</td>
<td>36</td>
</tr>
<tr>
<td>THE COMPANY</td>
<td>37</td>
</tr>
<tr>
<td>TABLE OF FIGURES</td>
<td>38</td>
</tr>
</tbody>
</table>
Introduction
The CD52 Bandit is a computerized electronic device that allows for the non-intrusive detection of pipeline pigs that have been equipped with either a permanent magnet or a magnetic transmitter. The Bandit accomplishes this by means of a proprietary and patented magnetic field antenna array located in its base and attached to (or near to) the pipeline. This antenna array signals an on-board computer when and if a pig passage has occurred.

Once a pig has been detected, the time and date of passage are recorded into the memory of the Bandit and displayed to the operator. In addition to the most recent pig passage time and date, the Bandit will remember the times and dates of the previous 9 pig passages as well. Therefore, an operator may quickly and easily retrieve the times and dates of the 10 most recent pig passages via the Bandit’s user interface.

Power Options
The Bandit in its standard configuration is powered for a period of approximately one year on two new D-Cell alkaline batteries. However, many customers choose to power the Bandit by supplying an input voltage of +24VDC. In extreme cold temperatures, +24VDC will be necessary to power the Bandit. See the Temperature Requirements chart below to determine which power option is required for your conditions.

Temperature Requirements

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>Options Required for Operation in Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50°F to -22°F (-45°C to -30°C)</td>
<td>Heater Controller System and +24VDC Input Power</td>
</tr>
<tr>
<td>-22°F to -4°F (-30°C to -20C)</td>
<td>+24VDC Input Power</td>
</tr>
<tr>
<td>-4°F to 130°F (-20°C to 54°C)</td>
<td>Batteries or +24VDC</td>
</tr>
<tr>
<td>130°F to 176°F (54°C to 80°C)</td>
<td>+24VDC Input Power</td>
</tr>
<tr>
<td>Pipe surface temp above 176°F (80°C+)</td>
<td>Heat Risers</td>
</tr>
</tbody>
</table>
Batteries
If you choose to use 2 D-Cell alkaline chemistry batteries as your power source, see drawings below for installation and User Board jumper settings.

Please Note:
For your convenience the cable-ties that are shipped with the CD52 Bandit to hold the batteries in place are releasable and do not need to be cut. Depress the release as shown to allow for battery removal.

D-Cell Battery Installation
To install batteries into the Bandit, start by carefully removing the front cover of the unit. If old batteries are in place, remove them by pulling up on the releasable cable-tie’s release tab until the cable-tie disengages and then removing the batteries. Insert new alkaline batteries with their positive (+) side up on either side as shown below in Figure 1.

Figure 1 - Battery Insertion
Battery User Settings
To use D-Cell batteries as your power source, ensure that the jumpers on the User Board are installed as shown below in Figure 2 prior to installation of the batteries.

Figure 2 - Jumper setting to use alkaline batteries

Figure 3 - Jumper setting to use alkaline batteries (close-up)
+24VDC User Settings

If you choose to use +24VDC as your power source, ensure that the jumpers on the User Board are installed as shown below in Figure 4 prior to application of electrical power.

USER SETTINGS

![Figure 4 - Jumper setting to use +24VDC input](image)

![Figure 5 - Jumper setting to use +24VDC (close-up)](image)
**+24VDC & SCADA Connections**

To input +24VDC power and SCADA into the Bandit unit it is necessary to remove the plug at the bottom of the junction box. In order for the Bandit to remain watertight once this plug has been removed, it is critical that the hole be resealed properly with pipe dope or pipe sealant and a proper conduit pipe.

**NOTE:** It is the responsibility of the customer to ensure that conduited connections are made and sealed properly.

*Figure 6 – Killark box*

The customer provided wiring for input voltage and SCADA will be attached to this junction box. To achieve this, remove the faceplate and feed customer provided wiring through customer provided conduit to into the round Killark junction box. Using the wiring diagram below, attach customer wiring to proper terminals.

*Figure 7 - Killark enclosure with factory installed wiring*

Once these connections are made, replace the junction box cover and secure hand-tight. At this point, with correct electrical connections, you should have an assembled and fully functional CD52 Bandit system. A system wired in this manner is capable of running on +24VDC +/- 0.5 VDC and indicating a passage to the SCADA system via relay closure.
CD52 BANDIT
WIRING INSTRUCTIONS

1. Remove plug in the bottom of the outlet body for insertion of customer wiring.
2. Remove the lid of the outlet body.
3. Install the customer provided conduit and wiring. (In order for the Bandit to remain watertight with this plug removed, it is important for the hole to be sealed properly with pipe dope or pipe sealant and a proper conduit pipe used.)
4. Reassemble the lid with the outlet body.

*It is the responsibility of the customer to make these connections properly whatever pipe or conduit is chosen for the job.*

CDI CONNECTIONS

- BLACK WIRE
- BROWN WIRE
- RED WIRE
- ORANGE WIRE
- WHITE WIRE

CUSTOMER CONNECTIONS

Customer Wiring Inlet

If 24V Connections were used, complete steps 5 & 6

5. Open Bandit enclosure and move jumper on PCB as shown in Detail 'A'.
6. Replace Bandit enclosure.

+24V DC POWER OPTION

<table>
<thead>
<tr>
<th>INSTALLATION SITE POWER</th>
<th>CD52 BANDIT OUTLET BODY</th>
<th>INSTALLATION SITE SCADA</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V DC</td>
<td>+24V DC</td>
<td>INPUT</td>
</tr>
<tr>
<td>-24V DC</td>
<td>-24V DC</td>
<td>COMMON</td>
</tr>
<tr>
<td></td>
<td>N.O.</td>
<td>COMMON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>INPUT</td>
</tr>
</tbody>
</table>

INTERNAL BATTERY POWER OPTION

<table>
<thead>
<tr>
<th>CD52 BANDIT OUTLET BODY</th>
<th>INSTALLATION SITE SCADA</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.C.</td>
<td>INPUT</td>
</tr>
<tr>
<td>+24V DC</td>
<td>COMMON</td>
</tr>
<tr>
<td>N.C.</td>
<td>COMMON</td>
</tr>
<tr>
<td>-24V DC</td>
<td>INPUT</td>
</tr>
</tbody>
</table>

Figure 8 - CD52 Bandit Power and SCADA Wiring Diagram
Detection Methods
The Bandit is able to detect pig passages via two distinctly different methods: permanent magnets and magnetic transmitters. Each of these methods has its own advantages which are discussed below.

Permanent Magnets
The Bandit can detect rare earth permanent magnets attached to a pipeline pig. Magnets for this purpose are sold by CDI which are available for pipelines from 2” to 60” in diameter.

Figure 9 – CDI’s M3, M2 & M1 rare earth trip magnets
The advantages of rare earth permanent magnets are that they are small, inexpensive and do not require batteries that must be replenished. Maintenance is also very low for permanent magnets. Despite these benefits, using a permanent magnet for pig passage indication means that should the pig become stuck somewhere within the pipeline system, it will be difficult to find easily since it is a static (i.e. DC) magnetic field.

If there is a chance of a pig becoming stuck in your pipeline, CDI recommends that an active transmitter (discussed next) be used. This will not only trigger your Bandit but it will also allow the pig to be located quickly and easily should it become stuck somewhere in the pipeline. To locate a transmitter, CDI recommends our own CD42 Pig Location & Tracking System.
Magnetic Transmitters
The Bandit can readily detect transmitters that emit a magnetic field. The advantage of active transmitters such as CDI’s family of transmitter (shown below in Figure 11) is that should the pig become stuck somewhere within the pipeline system it can be found by starting at the last Bandit location that it was known to have passed and walking the pipeline downstream using a handheld receiver to detect the transmitter.

![Image of magnetic transmitters](image)

*Figure 11 - Some of CDI's wide variety of magnetic transmitters*

The disadvantages of using active transmitters are the higher cost and the maintenance of batteries that must take place in order for the system to work.

It is possible to use both permanent magnet and a transmitter in the same pig. This will not affect the Bandit or the CD42 Receiver system from tracking and locating any pig.

Regardless of which type of transmission source you use, the Bandit will detect it.
The User Interface

The user interface of the Bandit is designed to be simple and easy to read, and yet to have a large amount of information conveyed to the operator. An overall view is presented below.

![Figure 12 - An overall view of the Bandit’s high contrast LCD screen](image)

This display automatically cycles between showing the most recent pig passage time, date and the actual real-time every seven (7) seconds. This allows the operator to simply approach the Bandit on the pipeline and see the most recent pig passage time, as well as verify that the Bandit’s internal clock is set correctly – all without having to touch the unit.

Referencing the numbers above we can take note of the various major aspects of the Bandit’s display:

1) **Passage Time / Current Time**

These display segments normally alternate between showing the most recent pig passage’s time and the actual real-time as known by the Bandit unit. During the time that the real-time is displayed the colon will blink and the “TIME” Active Function Indicator segment will be lit.

When the most recent pig passage time is displayed the colon will be static (non-blinking) and the “TIME” Active Function Indicator segment will not be lit.

2) **Passage Date / Current Date**

These segments normally alternate between displaying the real-time date and the date of the most recent pig passage. This date...
is in American format (month displayed first) and the year is not displayed. Therefore, 7-16 would be July 16th, with the year assumed to be the year that you are currently in (i.e. 2010).

**Recent Passage Indicator**

The Recent Pig Passage Indicator Segment is a large segment that consumes most of the lower half of the Bandit’s display area. This segment indicates that a pig passage has been detected recently. The behavior of this segment conveys information about how recent the pig passage was. When a pig passage occurs, the segment will flash once a second. This flashing behavior remains in effect for a period of one full hour after the pig passage. After one hour has elapsed the display will switch to a constant-on mode. This feature allows an operator to approach the unit and know quickly and easily how recent a pig passage has been. If the segment is blinking, then the passage has occurred within the last hour of real-time. If the segment is lit but not blinking, then the most recent pig passage has occurred within the last 12 hours, but was more than one hour ago.

<table>
<thead>
<tr>
<th>RECENT PASSAGE SEGMENT STATUS</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEGMENT NOT LIT</td>
<td>No passage detected within the last 12 hours</td>
</tr>
<tr>
<td>SEGMENT BLINKING</td>
<td>Passage was detected within the last one hour</td>
</tr>
<tr>
<td>SEGMENT LIT, NOT BLINKING</td>
<td>Passage was detected more than one hour ago, but less than 12 hours ago</td>
</tr>
</tbody>
</table>

*Figure 13 – How to interpret the behavior of the Recent Passage Segment*

**Displayed Passage Indicator**

The Displayed Passage Indicator is a cone-shaped array of 10 segments. Each one of these individual segments represents one of the 10 pig passage times that are recorded in the Bandit’s memory. The larger the segment is, the more recent the pig passage that it represents. Therefore the rightmost, largest segment represents the absolute most recent pig passage in memory while the smallest, leftmost segment represents the oldest recorded pig passage time and date in memory.

In normal default operation the largest, rightmost segment is lit and the time and date of the most recent pig passage is displayed.
Active Function Indicators

The Active Function Indicators are an array of 10 rectangular LCD segments aligned vertically along the left-hand side of the display. Only some of these segments currently have a purpose, while the others are reserved for future functions and customer requested customizations.

The current functions assigned to the Active Function Indicators are:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Indicates the unit is in Suspend Mode <em>(Optional Feature)</em></td>
</tr>
<tr>
<td>F2</td>
<td>Indicates the unit is in Suspend Mode <em>(Optional Feature)</em></td>
</tr>
<tr>
<td>F3</td>
<td>Reserved</td>
</tr>
<tr>
<td>F4</td>
<td>Reserved</td>
</tr>
<tr>
<td>RELAY</td>
<td>Indicates that the internal dry contact relay is engaged</td>
</tr>
<tr>
<td>F6</td>
<td>Reserved</td>
</tr>
<tr>
<td>F7</td>
<td>Reserved</td>
</tr>
<tr>
<td>F8</td>
<td>Reserved</td>
</tr>
<tr>
<td>TIME</td>
<td>Real-Time is currently being displayed</td>
</tr>
<tr>
<td>BTN</td>
<td>Indicates that the user interface lever is currently engaged</td>
</tr>
</tbody>
</table>

*Figure 14 - Function Indicators*

Display Rotation

During the Bandit’s normal operation it automatically cycles between two display screens. The first set of information is the time and date of the most recent pig passage. The second screen of information is the current Real Time.

Let us say that a Bandit unit has recorded its most recent pig passage at 3:35pm on July 16, and that it is now 5:20pm. If that were the case the operator would see two cycling displays that looked like the following which cycled every seven seconds:
The Bandit’s Interface Lever

The times and dates of the ten most recent pig passages are always stored within the nonvolatile memory of the Bandit. To access this information, one uses the pivoting “lever” on the side of the unit. The lever contains a small magnet that actuates a reed switch through the explosion-proof housing. This allows the unit to have a fully explosion-proof user interface. In its disengaged position, the red lever hangs down. To activate the lever, simply grasp the lever with your right hand and rotate the bottom of the lever away from you. Rotating this lever controls all aspects of the Bandit’s user interface.

Figure 15 - Display Rotation

Figure 16 - Activating the Bandit’s Interface Lever
Any time that you activate the lever of the Bandit, the “BTN” segment will light on the display. This gives visual feedback that the contact closure is being made. The “BTN” segment is illustrated below.

![Figure 17 - The BTN LCD Segment](image)

Should the lever of the Bandit become stuck, or engaged for a period of time exceeding 1 minute and 45 seconds, the unit will automatically return to normal operation, disregarding the lever rotation. This insures that the unit will always be able to detect pig passages, even if the lever becomes damaged, vandalized, or simply stuck in the “engaged” position due to wind, ice, etc.

**Most Recent Pig Passage Display**

Pig passages are captured and indicated on the display of the Bandit. Typically the operator is interested in the time and date of the most recent passage. Therefore, during normal operation the Bandit displays this information by default. *You should be able to approach any unit and see the most recent passage data without having to interact with the unit in any way.*

When displaying the time of the most recent passage, the display will look like below. Please take a moment to review it.

![Figure 18 - A “Most Recent” Pig Passage Display](image)
Real Time Display

The primary purpose of the Real Time display is to allow an operator to quickly and easily confirm that the clock within the Bandit is set to correct time. If you notice that it is incorrect and wish to set it, please follow the instructions beginning on page 21.

The Real Time display has the following characteristics:

1) No Displayed Passage Indicator segments are lit, indicating that no passage times are being displayed.
2) The time’s colon does blink, indicating that the time shown is “active” and ticking.
3) The “TIME” segment is lit, indicating that the Real Time Display is active.

Figure 19 - A “Real Time” Display

Previous Pig Passages

In order to review pig passage times and dates other than the most recent one, use of the Bandit’s user interface is required. Simply grasp the red lever in your right hand and rotate the bottom of the lever away from you and toward the rear of the unit. Hold the handle in this position until you notice the BTN LCD segment light as shown below.

Figure 20 - The BTN activation LCD segment

When this segment lights, the Bandit is acknowledging that it has received the lever press. Release the lever back into its disengaged position. You should now notice a change in the Bandit’s display as it shows you the time and date of the second most recent pig passage. You will know which pig passage is being displayed to you by again looking at the display of the unit. If you have followed the steps above
successfully, then the Bandit display should look similar to the following after one lever press.

![Diagram of Bandit display indicating second most-recent pig passage](image)

**Figure 21 - Display indicates second most-recent pig passage**

This display indicates that the second most-recent pig passage occurred at 10:16am on December 14th. Repeatedly pressing and releasing the lever will move you back in time through the recorded pig passages and change the Displayed Passage Indicator segment to the corresponding indicator. Moving to the oldest passage in memory requires a total of nine (9) lever activations, after which the Displayed Passage Indicators segments wrap around to the most recent passage time again.

To exit this mode and return to the normal operating mode of cycling between the most recent passage time and the Real Time, simply allow the lever to hang in its disengaged position for a period of twenty-five (25) seconds. Normal display cycling will resume.

**Clearing the “Recent Passage” Flag**

When a pig passage occurs and is recorded by the Bandit, the “Recent Passage” LCD segment begins blinking. This segment, as discussed above, blinks for one hour after a passage and then remains lit but discontinues blinking for an additional 11 hours. For various reasons the operator may wish to manually discontinue the blinking of the “Recent Passage” message (perhaps the unit is being used in a portable application or on a launcher or receiver). To accomplish this, simply rotate the lever into the “activated” position and hold it there for a period of four (4) seconds. After four seconds you should see that the “Recent Passage” segment extinguishes itself. Once the segment has extinguished itself, immediately release the lever and the unit will return to normal operation without a recent passage being indicated.
Manually extinguishing the “Recent Passage” message in this way does not affect the stored pig passages. The most recent pig passage time and date will cycle every few seconds, and all previous pig passages will still be available to you by using the user interface. *The only thing that is accomplished by clearing the “Recent Passage” message is that the segment will discontinue displaying itself.*

**Setting the Clock**

Occasionally it will be necessary to set the Real Time clock inside the Bandit unit. To do so, simply grasp the red lever and swivel it into the activated position. Hold the lever in the activated position for a period of eight (8) seconds. After eight seconds you will see the majority of the Bandit’s display go blank. Release the lever, and then briefly press and release it one time. You should then be presented with a display that looks similar to the following, depending upon what the unit’s current time is set for.

![Setting the Real Time Clock](image)

*Figure 22 - Setting the Real Time Clock*

The Bandit is now prepared to set the hours portion of the clock. To change the hours, simply rotate the lever to the activated position and hold it there. You should notice that the *BTN* segment lights and that the hours digits begin to increase at a rate of one hour per second. Continuing to hold the lever in the activated position will cause the hours to increase until they reach “12”, and then wrap to “1” (The Bandit uses 12-hour, not 24-hour time). Hold the lever in the activated position until the digit reaches the desired hour and then release the lever. Upon release of the lever the display will immediately jump to the minutes portion of the time to allow you to set it. Use the same method to set the minutes that you used to set the hours. Simply press and hold the lever to increment the digits, and release to move to the date.
Repeatedly pressing and releasing the lever while in clock set mode causes the clock set mode to cycle through the following clock set options:

1. HOURS
2. MINUTES
3. AM/PM
4. DAY
5. MONTH

To end the clock set mode, simply release the lever. Normal Bandit operation will return in twenty-five (25) seconds and the clock will be set to the time that you indicated.
Optional Equipment

Portability (Trigger Suspend)

The Bandit has a portability option that, when ordered, allows the operator to move the system from place to place on a pipeline. This type of movement of the system requires a “suspend” feature so that false pig passages are not recorded as the system is moved. To suspend the Bandit system so that it may be moved along the pipeline, simply press the shrouded button located at the topmost point of the unit.

![Figure 23 - A Bandit with the Optional Suspend Button](image)

When you press this button, you should notice that the topmost two of the Active Function Indicator LCD segments begin to blink in an alternating pattern once every second. This indicates that the Bandit is in suspend mode. Below is an illustration indicating which of these LCD segments blink.
Once the Bandit has been located at its new position to receive pig passages, simply press the suspend button again to remove the Bandit unit from suspend mode. The LCD segments shown above will halt blinking behavior and the unit will be able to receive pig passages once again.

**Note:**
It is important that the Suspend Mode be used when transporting the Bandit unit from one location to another along a pipeline. If this feature is not used, the Bandit will receive numerous false triggers due to the fact that the system utilizes magnetics as its detection means. When you move the unit within the earth’s magnetic field, or physically shock the antennas, you create a large magnetic field that is detected by the unit.

**Remote Indicator System (RIS)**
The Remote Indicator System (RIS) may optionally be added to any +24VDC powered Bandit system to allow viewing pig passage indications at distances as great as 100 meters (328 feet). The RIS consists of a ring of high luminosity LEDs that surround the standard LCD display of the system as shown below in Figure 25.
Heater System

The optional heater system for the CD52 Bandit allows operation in climates where the system will be exposed to the cold for extended periods. It consists of a small thermally activated resistive element that is contained within the explosion-proof housing.

The heater option is recommended at temperatures below -22°F (-30°C) and necessitates that the Bandit system be powered by +24VDC. The heater option may consume a maximum of 12 Watts of power intermittently when installed.

Heat Risers

Heat riser insulators for the CD52 Bandit allow the system to be used in circumstances where the surface temperature of the pipeline sustains temperatures in excess of 176°F (80°C). This system may be deployed for heated or geothermal pipeline work.

The heat risers are metallic mechanical spacers that dissipate heat and are placed between the receiving antenna of the Bandit system and the pipeline and strapped into place.
Installation

The Bandit can be installed on pig launchers, receivers and all pipelines from 6” to 60”. It is best that the Bandit be mounted on horizontal pipe, as the interface lever may not function properly if on a vertical or inclined pipe. The Bandit’s base is 20” long. Make sure there is enough room on the pipe for installation.

Note: The band tension tool and banding material shown in the following procedure are stocked by CDI.

Step 1: Prep Banding

Prepare the band and buckle. Slide the buckle over the band and crimp in place, as shown below.

![Crimp the Metal Band](image)

Step 2: Attach Base

Attach the base of the Bandit to the pipeline using the bands. Handle with care as the antenna is inside the aluminum cast base.

If needed, use electrical insulators to prevent interference with cathodic rectifiers. Loop the band through the slots at one end of the base.

Slide the free end of the band through its buckle.
Step 3: Tighten Tension
Tighten the tension on the band using a tension tool, as shown below.

Step 4: Cut Excess
Cut off the excess banding material. Raise the tension tool to bend the band back over the buckle. Pull the cutoff lever to trim the unneeded material.
Cutting the Excess Band

Step 5: Secure Buckle
Secure the buckle. Bend the end of the band down by lightly tapping with a hammer. Using a hammer, bend the two locking tabs over the end of the band.

Securing the Buckle
Repeat steps 1 through 5 to attach the buckle and band on the other end of the mounting bracket.
Once installation is complete, the face of the Bandit can be turned as much as 180° in either direction to obtain the desired orientation for optimum viewing. To do this, loosen the union joint provided and adjust the Bandit face to the desired position. Retighten union joint.

If you have any difficulties or questions assembling and installing your Bandit system, please feel free to contact CDI through the means mentioned on the cover page of this document.

**Figure 26 - Union Adjustment**
WARRANTY AND SERVICE OF EQUIPMENT

All equipment sold by Control Devices, Incorporated (CDI) is warranted for a period of one (1) year from the date of shipment to Purchaser, providing the instrument or equipment has not been modified, abused or used for purposes other than that for which it was designed. Batteries, probes, leads, magnets and other items, which are consumables or are subject to wear are not covered by this warranty. CDI will repair or replace faulty equipment during the warranty period when the cause is a defect arising from faulty design, materials or workmanship.

MAKING A WARRANTY CLAIM

Equipment that is being considered for warranty repair, or a representative sample thereof, must be returned to CDI at the Purchaser’s expense. The goods must be accompanied by the Purchaser’s written order describing the defect(s) and authorizing CDI to invoice the Purchaser for any charges not covered by the warranty.

Upon receipt of the equipment and Purchase Order, CDI will examine the equipment and make a determination of the nature and cause of the defect. If the defect is not covered by the warranty, CDI will quote to Purchaser the cost for replacement or repair equipment, and will not proceed until Purchaser delivers a written acceptance of the quotation.

During the one year of warranty, CDI will bear the cost to return goods repaired under the warranty back to the Purchaser’s premises within the United States and Canada. At the Purchaser’s expense, CDI will return goods to foreign countries.

CARE AND MAINTENANCE

Equipment designed by CDI is protected against the environment in which it is intended to operate. Much of the equipment is designed for prolonged use in the field without any special maintenance other than routine battery replacements or recharging. It is the Purchaser’s responsibility to insure that proper precautions are taken during installation and operation so that weather seals are in place, routine maintenance occurs, etc. Failure to perform these operations nullifies this warranty.

CDI equipment should only be operated by qualified personnel who are familiar with any and all manuals and procedures for said equipment’s operation.

Operating equipment while in a damaged condition nullifies this warranty.
SERVICE REPAIRS AND MAINTENANCE

Cost for repairs not covered by the warranty or that are carried out after the warranty period expires will be charged at the current hourly or set service rate, plus the cost of materials, upon approval of Purchaser.

Equipment for repair must be sent at the Purchaser’s expense and be accompanied by the Purchaser’s written order describing the defect and authorizing CDI to invoice the Purchaser for labor, materials and return delivery cost.

No service or repair will be undertaken until an approved written order is received from the Purchaser.
Figure 27 – Portable CD52 for temporary installation
(for larger see www.pigging.com)

Figure 28 - CD52-12 permanent installation above ground
(for larger see www.pigging.com)
Figure 29 - CD52-Bandit for permanent installation below ground (for larger see www.pigging.com)
SYSTEM SPECIFICATIONS

Detection:
Detection Type: Non-Intrusive Magnetic
Devices Detected: CD42-Tx Pig location and tracking transmitters and CD52-Mx Pig tracking permanent magnets
Detection Direction: Bi-directional

Passage Visual Indicator Type: LCD Flash for one hour, constant for 11 hours then auto reset
Detection speed: 0.01 Meter/Second (0.0226 MPH) to 20 Meter/Second (44.738 MPH)

Isolated Contact Closure
Type: Auto reset on every Passage
Type: Double Pole - Double Throw. Closed to indicate a pig passage, opened after 15 seconds
Maximum Current: 2 Amps at 30 Volts DC

Battery:
Battery Life: One full year on two standard 1.5VDC D-Cell alkaline batteries

Line:
Line sizes: 6 Inch - 60 Inch / 152 mm - 1524 mm
Pipe wall Thickness Maximum: 1.5 Inch / 38.1 mm

Temperature Range:
-4°F to +130°F / -20°C to +54°C powered with Batteries
-22°F to +176°F / -30°C to +80°C powered with remote +24VDC (RIS optionally)
For applications that are between -22°F / -30°C to -50°F / -45°C an optional Heater Controller System and remote +24VDC is required (RIS optionally)

Pig Passage Counter:
Total Passage Count: 10 (First In First Out) Stored Passage Information: Time and Date are stored through power outages. 100 Passage Count as an option.
Pipe mounting Assembly Material: Aluminum
Mounting Method: Stainless Steel 316 banding and buckles
Remote Indicator System (RIS Optional)
Type: Flash indefinitely until Manually Reset
Device: 16 Super Bright LEDs
Viewable Range: Minimum of 100 Meters

Power Requirements:
Standard: 0.48 Watts
Heater Option: 12 Watts intermittent
RIS Option: 8.4 Watts

System Design Life:
Operational: 20 Years
Storage: 20 years
Identification Name Plate Material:  Engraved Stainless Steel

**Enclosure Specifications:**
Material: Aluminum  
Window: Tempered Glass

**Classes:**
Class I, Div 1, Groups B, C, D  
Class II, Div 1, Groups E, F, G  
Class III  
NEMA 4, NEMA 7BCD, NEMA 9EFG

**Certifications:**
FM Standard 3615  
CSA Standard C22.2 No.30  
UL Standard 1203  
CENELEC Standard EN 50014, 50018  
ATEX (Ex d IIC II2 G); (II2 D) (Enclosures employed EYS cemented joints)  
Type 4X and IP66 Environmental Ratings
Magnet Mounting Overview

CD52-Mx magnets (shown on page 11 in Figure 9) and CD42-Tx transmitters (on page 13 in Figure 11) can be mounted onto foam, uni-cast or metal pigs. Virtually any pig may be equipped to be detected by the CD52 Bandit system.

Option 1: Magnet or transmitter mounted to a foam pig

Option 2: Magnet or transmitter mounted to a metal bodied pig
The Company

CDI is a family owned and operated business located in Broken Arrow, Oklahoma just 12 miles from downtown Tulsa. Incorporated in 1982, CDI has been proudly manufacturing products in the United States for over 28 years. Currently CDI employs 30 people in the areas of electronics and mechanical design, software and firmware programming, electronics manufacture, machining and more. All of CDI's products are designed and built completely in-house utilizing an on-premises machine shop boasting four fully-automated CNC machines as well as full-time electronics assembly personnel.

Figure 30 - CDI’s facility in Broken Arrow, Oklahoma
# Table of Figures

Figure 1 - Battery Insertion ........................................................................................................ 6  
Figure 2 - Jumper setting to use alkaline batteries ................................................................. 7  
Figure 3 - Jumper setting to use alkaline batteries (close-up) .................................................. 7  
Figure 4 - Jumper setting to use +24VDC input ..................................................................... 8  
Figure 5 - Jumper setting to use +24VDC (close-up) ............................................................... 8  
Figure 6 – Killark box ................................................................................................................ 9  
Figure 7 - Killark enclosure with factory installed wiring ......................................................... 9  
Figure 8 - CD52 Bandit Power and SCADA Wiring Diagram .................................................. 10  
Figure 9 – CDI’s M3, M2 & M1 rare earth trip magnets ......................................................... 11  
Figure 10 - Dimensional drawing for the M1, M2 & M3 magnets ............................................ 12  
Figure 11 - Some of CDI’s wide variety of magnetic transmitters ........................................... 13  
Figure 12 - An overall view of the Bandit’s high contrast LCD screen .................................... 14  
Figure 13 – How to interpret the behavior of the Recent Passage Segment ............................ 15  
Figure 14 - Function Indicators ................................................................................................. 16  
Figure 15 - Display Rotation ..................................................................................................... 17  
Figure 16 - Activating the Bandit’s Interface Lever ................................................................. 17  
Figure 17 - The BTN LCD Segment ......................................................................................... 18  
Figure 18 - A “Most Recent” Pig Passage Display .................................................................. 18  
Figure 19 - A “Real Time” Display ......................................................................................... 19  
Figure 20 - The BTN activation LCD segment ...................................................................... 19  
Figure 21 - Display indicates second most-recent pig passage .............................................. 20  
Figure 22 - Setting the Real Time Clock .................................................................................. 21  
Figure 23 - A Bandit with the Optional Suspend Button ........................................................ 23  
Figure 24 - LCD segments blink to indicate suspended state ................................................. 24  
Figure 25 - Remote Indicator System (RIS) ........................................................................... 24  
Figure 26 - Union Adjustment .................................................................................................. 29  
Figure 27 – Portable CD52 for temporary installation ............................................................. 32  
Figure 28 - CD52-12 permanent installation above ground .................................................... 32  
Figure 29 - CD52-Bandit for permanent installation below ground ........................................ 33  
Figure 30 - CDI’s facility in Broken Arrow, Oklahoma ............................................................. 37