OPERATION MANUAL

MDX-1

METAL DETECTOR

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1.0 INTRODUCTION

1.1 UNIT FEATURES

MDX-1 is an advanced microprocessor based electronic Metal Detector. It has a modular design comprising of a power supply unit PSU, a microprocessor unit CPU connected to a separate keypad overlay. The search head coils consists of a transmitter coil sitting on the top of a conveyor belt and two dual wounded receiver coils sitting under the conveyor belt. These coils are connected to the transmitter and receiver in the PSU board.

The PSU and CPU modules conveniently plug into each other so that field service replacement is easily accomplished.

The printed circuit board is mounted in a base plate, which in turn can be mounted in a custom or industrial enclosure. The standard enclosure, as supplied by Web-Tech Australia Pty Ltd, is an IP66 rated fibreglass enclosure with the membrane keypad installed on the front of the enclosure.

Following is a list of general features of MDX-1 Detector.

- Motorola 68HC11 cpu.
- A 22 bit Analog to digital converter.
- A simple, menu driven, user interface.
- All commands and data are entered via a 20 key membrane keypad with audible beeper.
- All information and user prompts are displayed via a 2 line by 40 character LCD display with backlighting.
- Circuitry to provide the CPU with advance warning of power failures.
- All CMOS circuitry for lower power consumption.
- Real time clock to record alarm times and dates.
- RS232 interface for alarm history print out.
- Belt splice detector sensor.
- Transmitter search head has swing away construction to protect it from being damaged by big objects on the belt (Optional).
- A large indicator (flag marker) can be dropped onto the belt at the position that the tramp is detected.
- Detector is not sensitive to product types nor moisture contents of products.
- Less prone to false alarm due to dual receiver coils and advanced signal processing.
- Easy setup, does not need balancing and very low maintenance is required.

1.2 PRINCIPLE OF OPERATION

MDX-1 Metal Detector utilises a method called 'pulsed eddy current decay' to detect tramp metal. In this method, a transmit coil produces a pulse of magnetic field which rises to a maximum and then is allowed to decay at a rapid rate. This causes eddy currents in any conductive material in the field which first oppose the rise in the field and than reverse to oppose the fall in the field. These eddy currents persist after the current in the coil drops to zero and generate a small magnetic field of their own. This secondary field can be detected by a receiver that is gated in time to turn on after the coil

1.0 INTRODUCTION CONT.

current ceases, and fed by a receive coil on the opposite side of the material from the transmit coil.

The receiver comprises of two spatially separative coils. Signals from two coils are gated on during the period after the current in transmitted coils effectively stops and remains on for a short period. These signals are then amplified to appropriate voltage levels, and unwanted noises are filtered out.

The clean analog signals after analog processing are converted to digital signals and fed to the CPU for further digital processing. As the CPU constantly monitors the received signals, it can differentiate the signal from noises, vibration, electrical interference, and from tramp metal signals. When a tramp metal signal signature is matched, the CPU will send commands to drop the marker, stop the belt, raise alarms and record the tripping time and date.

The Detector will resume normal operation after the operator has returned the flag marker and pressed the reset button.

2.0 KEYPAD LAYOUT AND KEY FUNCTIONS

KEYBOARD LAYOUT

RESET	1	2	3	4
Monitor	5	6	7	8
TEST	9	0	C	MENU
PRINT	-	./+	A Abort	E Enter

2.1 USING KEYPAD, LCD DISPLAY AND MENU SYSTEM

The user interface for the Metal Detector unit consists of a 20 key membrane keypad for data entry and a 2 line by 40 character LCD unit for information display.

The Metal Detector user interface is based on a menu system consisting of a main menu and several additional menus for display and modification of unit configuration.

Each menu entry may include several “steps” which displays information, allows parameter modification, etc.

The keys ‘-’ and ‘+’ will auto-repeat at a rate of 4 times per second if held down for more than one second.

2.2 KEY FUNCTIONS

MENU

This key switches between the main display mode and the "Menu" mode.

From the main menu, pressing MENU will display menu 1.

From the menu mode, pressing a number will go to that menu, pressing MENU then ENTER will go back to the main menu.

-	./+

When in the menu mode, pressing ‘./+’ or ‘-’ will go forward or backward one menu. If either key is held down, the menu changes will repeat approximately 4 per second. When entering a number, the ‘./+’ key is the decimal point.

A Abort

When in menu mode, pressing Abort will return to step zero (top level) of a menu.

2.0 KEYPAD LAYOUT AND KEY FUNTIONS CONT.

C

Similar to "Abort", except that the current screen data only is cancelled and the existing entries restored. The display remains at the current screen.

The Clear key is also used to perform functions in certain menus, the menus will explain the use of the Clear key.

0 .. **9** **./+**

These are the data entry keys used in the menu entry steps that request parameters values.

When in step 0, these keys are also used to directly jump to another menu.

ENTER

When in the menu mode, pressing ENTER will advance to the next menu entry step, at the same time accepting any data entered in the current step, or if no value was entered, the previous value is re-confirmed.

When in the main menu, pressing ENTER displays the Metal Detector status menu.

2.3 SPEED KEYS

Speed keys allow quick access to menu functions from the main menu.

RESET

Used to reset the Metal Detector after an alarm.

Monitor

Used to monitor the metal signals from receiver coils 1 and 2.

TEST

Used to test Output Relays.

PRINT

Used to print out an alarm history via the serial port

3.0 MAIN MENU

The Main menu is the default menu when the Metal Detector is first powered up. The top line displays the coast count, total trip count and threshold level. The second line displays channel 1 signal level, both in numeric and bar-graph forms, as well as the status of the Detector.

Step 0:

```
Coast: 0  Total: 1  Threshold:  80
Level:   0 [##_____________]  normal
```

Press ENTER to view the system status in detail. If the system is normal, the following message will appear on the screen :

Step 1:

```
System normal  - Reset =  1 (+ to clear)
          Configure =  1 (- to clear)
```

If the system is not normal, an error message will appear the on screen, just follow the suggested actions to fix the problems.

Step 1A:

```
Status: Marker flag off hook !
Check flag, switch and cables
```

This message appears when Digital Input 3 is on. Digital input 3 will be on when the flag marker is not in the correct position. If this message appears, check that the flag marker is correctly inserted into the releasing device. If the marker is correctly inserted and the message still appears, check that the switch on the flag marker is operating correctly and that all of the interconnecting cables are securely and correctly connected and that they are in good condition.

Step 1B:

```
Status: Splice sensor activated!
If persisted, check sensor and cables
```

This message appears when Digital Input 2 is on. Digital input 2 turns on when the belt splice sensor detects a metal object in front of it. This is normally the belt splice, and will only turn the input on for a fraction of a second as the belt splice passes the sensor. If this input stays on permanently, check that there are no metal objects in front of the belt splice sensor, the distance from the sensor to the belt is within the tolerance specified in the technical section of the proximity sensor manual, and that all interconnecting cables are in good condition. The sensor operation can be tested by removing it from its normal mount, and checking that the output of the sensor (checked at the input of the MDX) changes states as a piece of metal is passed in front of the sensor and close to it.

Step 1C:

```
Status: Swing away switch activated!
If persisted, check switch and cables
```

This message appears when Digital Input 4 is on, indicating that the switch used to detect a disturbance to the physical position of the transmit (top) coil assembly (if installed) has been altered. Check the position of the TX coil assembly and the condition of the switch and all interconnecting cables if this warning appears.

Step 1D:

```
Status: Belt run is inhibited!
Press Reset to enable belt run
```

This message appears when the Detector has detected a metal object, and its outputs have been used to stop the belt running. Pressing the RESET button will reset this output from the MDX, allowing the other control equipment to restart the belt.

3.1 MENU 1 : SETUP

Menu 1 is used to set thresholds, nominal belt speed, marker pulse width, belt stop delay time and marker release delay time.

Step 0:

```
Menu : 1      Setup
Threshold=   80  Belt speed=   2.00 m/s
```

Press ENTER to go to step 1.

Step 1:

```
Normal threshold =      80
Enter new value?        0
```

Set this value from 2 to 3 times the peak idle signal. Reducing this value increase sensitivity of the Detector. However, systems will be prone to false alarms if this value is set too low.

Press ENTER to go to the next step.

Step 2:

```
Belt splice threshold =    2000
Enter new value?           0
```

When the belt splice passes through detector coils, it acts like tramp metal and generates large signals in the receiver. To allow the splice to pass without being interpreted as tramp metal, and still be able to detect a large tramp that is on the belt near the splice, the detector has to raise its signal threshold temporarily. To minimise tramp metal miss due to high threshold, set this value to just about 20% higher than peak belt splice level. The belt splice level should be observed from menu 2, step 2, when the splice passes through the detector during commissioning.

Press ENTER to go to step 3.

Step 3:

```
Setup belt speed =     2.00 m/s
Enter new value? (0.2-12.0)   0.00
```

Enter the nominal belt speed at this stage. The detector will use this value internally to calculate the expected rising time and separation of metal signals. Setting this value accurately will help reduce false alarms.

Press ENTER to go to step 4.

Step 4:

```
Marker pulse width =    100ms
Enter new value ? (0-1000)     0
```

This parameter controls the duration Relay 1 activates upon detecting the tramp metal. If an ink marker system is used, set this value so that the right amount of ink is discharged for the marking.

Press ENTER to go to step 5.

Step 5:

```
Delay before stopping belt =     1.00 s
Enter new value? (0.0-100.0)   0.00
```

When a tramp is detected, the belt will be left running until this time has lapsed. Set this parameter so that when the belt stops, the tramp metal will be exposed to an easily accessible section of the belt.

Press ENTER to go to step 6.

Step 6:

```
Delay before activate marker =     0.50 s
Enter new value? (0.0-  1.00)      0.00
```

Upon detecting new metal, the detector will wait for the above period before activating marker relay (relay 1). The marker relay will then activate for the duration set in step 4 of this menu (above).

The maximum value entry for marker delay is equal to the belt stop delay duration set in step 5 of this menu, which is displayed on the second line. The

3.2 MENU 2: MONITOR

example above shows the marker delay is 1.00 seconds.

Menu 2 is used to monitor the signals from receiver channels 1 and 2. The bar-graph shows the current positive and negative signal levels.

Step 0:

```
Menu : 2    Monitor
  -100            |<<#>>>|          150
```

Press Enter to go to step 1.

Step 1:

```
ADC1 count=  -163  Average1=   -164
ADC2 count=  -150  Average2=   -170
```

This step shows the absolute signal level in term of 'counts' from the analog to digital converter. A value of 0 indicates 0 mV while a value of -32000 represents -2.5V and 32000 represents +2.5V. The average values indicate the offset of the signals.

Step 2:

```
  -100          |<<#>>|           85
   -95          |<<#>>>|         105
```

This step shows the amplitude of signal around the average values in term of numeric values and a bargraph.

3.3 MENU 3 : ALARM HISTORY

Menu 3 is used to display the alarm history or to clear it. Every time the detector trips, the alarm count increases by one and the time and date is recorded. Up to 50 events are kept in its memory at one time. If the alarm count is greater than 50, a new count will overwrite the very first one in a first in first out fashion.

Step 0:

```
Menu : 3     Alarm history
Alarm count =    12    since  16/03/98
```

Press Enter to go to step 1.

Step 1:

```
Count: 12  Time= 17:09  Date= 19/03/98
Press -/+ for next data or E to continue
```

Press -/+ to step through the history count. Only 50 records are kept at one time, thus if the total count is 60, only records 11 to 60 are displayed.

Press Enter to go to step 2.

Step 2:

```
Press C to clear metal count
or E to continue
```

Press C to clear the metal count history, otherwise press Enter to go back to step 0.

3.4 MENU 4: TIME AND DATE

Menu 4 displays time and date information, as used in the recording of trips. To set the time and date go to steps 1, 2 and 3.

Step 0:

Menu : 4	Wednesday
Time = 15:26:30	Date = 26/08/98

Press Enter to go to step 1.

Step 1:

```
Time = 15:27:30
Enter new time ? (HHMM) :
```

Enter new time in the indicated format, pressing Enter without data entry will move to the next step without changing the time.

Step 2:

```
Day of week = Wednesday
Press C to change, E to accept
```

Press C to change the day of week or press Enter to leave it unchanged.

Press Enter to go to step 3.

Step 3:

```
Date = 26/08/98
Enter new date? (DDMMYY)
```

Enter the new date in the indicated format, pressing Enter without data entry will go back to step 0 without changing the date.

3.5 MENU 5 : Input/Output STATUS

Menu 5 is used to display the digital input and output status. It is also used to test the relays.

Step 0:

```
Menu : 5    I/O status
Input= 0 0 0 0  Relay= 0 0 0
```

In this step a 0 indicates the device is OFF and 1 indicates ON. Device numbers are arranged from left to right.

Currently I/O devices are assigned as follow:

IP1: Reset Button.
IP2: Belt splice sensor.
IP3: Flag marker off hook sensor.
IP3: Swing away switch sensor.

OP1: Flag marker relay.
OP2: Belt stop relay.
OP3: Alarm relay.

Press Enter to go to step 1.

Step 1:

```
Relay output =  0 0 0
Press 1 2 3 to test relay
```

Pressing '1', '2', or '3' keys will toggle the relays. Make sure the belt system is ready for the test, otherwise press Enter to go back step 0.

3.6 MENU 6: RS232 PARAMETERS

The Metal Detector includes a serial communications port to print out alarm count history to a serial printer.

The default communication parameters are :

- 9600 baud
- 8 bit data
- 1 stop bit
- No parity.

The baud rate can be changed from 150 bps to 9600 bps.

Step 0:

```
Menu : 6    RS232 Parameters
B:9600 bps  D: 8 bit  S: 1 bit  P: None
```

Press Enter to go to step 1.

Step 1:

```
Baud rate = 9600 bps
Press C to change, E to accept
```

Baudrates available : 9600, 4800, 2400, 1200, 600, 300, 150.

Pressing E at this stage will go back step 0.

3.7 MENU 7 : SENSOR BELT SPEED

The Metal Detector uses belt splice sensor to measure actual belt speed, to do so it measures time taken for the belt to travel 1 revolution then divided by belt length giving belt speed. Therefore belt speed is updated once every belt revolution.

Step 0:

Menu: 7 Sensor belt speed Current belt speed = 0.00 m/s

Press Enter to go to step 1.

Step 1:

Belt length = 10.00 m Enter new value ? (0-1000) 0.00

Enter the exact belt length at this stage. Press Enter when done.

Step 2:

Number of belt splices = 1 Enter new value ? (1-20) 0

Enter number of belt splices in the system. Press Enter will go back step 0.

4.0 RECONFIGURATING METAL DETECTOR

Under some circumstance, the Metal Detector's memory can be corrupted so that correct operation of the unit is not possible. This condition can occur if the Metal Detector has been subjected to severe electrical noise or spikes.

These phenomena usually occurs on the 240/110V AC power lines, however they can also appear on the search head cables. The Metal Detector has been protected as far as possible, however, severe noise or spikes can get through.

Once any part of memory has been corrupted, the Metal Detector will detect it and automatically flag an error. If the corruption has changed some data slightly, an error may not be detected and some erroneous results may occur. The only way to clear the memory of this data is by re-initialising.

Switching off and on will not clear the memory. The action of re-initialising causes all the calibration data to be lost and replaced by factory default data. The calibration data specific to your application can easily be re-entered if you have kept a note of what was in the menus.

LOG ALL CALIBRATION DATA, AS YOU MAY NEED TO MANUALLY RE-ENTER IT AT A LATER DATE.

To re-initialise the Metal Detector proceed as follows:

1. Switch off the Metal Detector.
2. Press the Enter key and hold it while switching the power on.
3. The display will now show the message:

Press C to configure or A to abort

4. Now press C key and the Metal Detector will return to normal running mode.
5. To check that configure has been accepted, press E key. Display will shows:

System normal Reset x (+ to clear) Configure x (- to clear)

Note: Each time the Metal Detector is powered up, reset figure increments one count. The configure counter remains the same unless another configure is attempted, whereupon the count increases by one.

6. Press E to return to normal mode.
7. Values in all menus will now default to factory values.

5.0 RS 232 INTERFACE

The Metal Detector unit provides a general purpose RS232 interface port. This port enables connection to a VDU, printer or another computer, for remote information display or print out of the alarm history.

The default interface for operation is at 9600 baud, 8 data bits, 1 stop bit and no parity. The baud rate can be set in menu 6.

The maximum recommended transmission distance is 100 meters, using a shielded cable, however, this depends on the environment in which the cable is being run.

Cable connection is showing in figure 4.

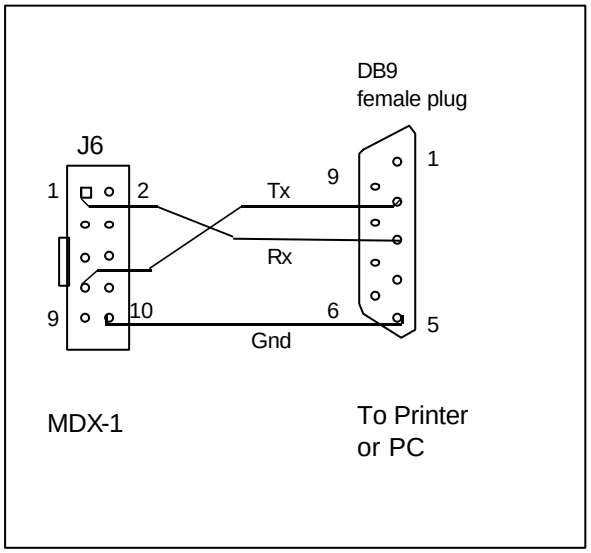


Figure 1. RS232 cable connection

5.1 Print function

The primary use of the RS232 port to a user is to enable printing out of an alarm history. Such a print out may be done to a display terminal, or to a hard copy unit.

The print out can be initiated by pressing 'Print' key. Following is a sample of the print out.

>Current time: 10:12, date: 25/09/98
Total alarm count: 9, since: 24/01/98.

Count	*Time*	*Date*
1	*11:38*	*24/01/98*
2	*11:57*	*18/02/98*
3	*12:06*	*18/03/98*
4	*12:33*	*18/04/98*
5	*12:35*	*18/05/98*
6	*12:35*	*18/06/98*
7	*12:36*	*18/07/98*
8	*12:45*	*18/08/98*
9	*13:07*	*18/09/98*

5.2 Remote Operation

When the MDX is turned on or restarted, it will send a small header to the RS232 port, which looks like this :

Metal detector MDX-01
Software version: A00, Date:02/02/98

Note that the date shown is the date that the software was written, not the current system date.

5.0 RS 232 INTERFACE CONT.

The RS232 port also allows limited control of the MDX from a remote terminal or PC. The available commands that can be initiated from the remote terminal are :

HISTORY	LOG
MONITOR	CAPTURE
CAPX	RESTART
DUMP	CLEAR
TEST	DATE
QUERY	TIME
MOD	HEADER
DINPUT	?
RELAY	

The Use of the applicable commands is as follows :

? – Displays the above list of available commands

History – Provides the same function as the PRINT key on the key pad, namely a record of the times and dates that tramps have been detected.

Dinput – displays the current status of the digital inputs.

Relay – displays the current status of the relay outputs.

Restart – restarts the computer.

Clear – performs the same function as the RESET button on the keypad, namely clearing the alarm status and resetting all of the relays to their normal state.

Date – displays the current system date.

Time – displays the current system time.

–r and **–rl** - These commands are useful for real – time monitoring of system variables (eg. Relay outputs), where adding –r after a command will repeat the output on the same line, and –rl will repeat the output on a new line each time the output is updated. These commands are not available for use with MONITOR, CAPX, LOG, CAPTURE, RESTART, CLEAR, DATE or ? commands.

The rest of the commands that have not been described here are of no use to normal operators, and should only be used by Web – Tech technicians.

6.0 FIELD TERMINALS

6.1 PSU BOARD

J1: Power supply and signals to CPU board.

J2: Transmit coil,
- T1: Tx-.
- T2: Central tap.
- T3: Tx+.
- Gnd: Shield.

J3: Receiver coils.
- Rx1+.
- Rx1-.
- Gnd: Shield.
- Rx2+.
- Rx2-.

J4: 240/110V AC mains
- A: Active.
- N: Neutral.
- E: Earth.

6.2 CPU BOARD

J1: Keypad connection.

J2: Digital inputs
- IP1: Reset button
- IP2: Belt splice sensor.
- IP3: Marker off hook sensor.
- IP4: Swing away sensor.

J3: Digital Output
- Relay 1: Marker

J4: Digital Output.
- Relay 2: Belt run/stop

J5: Digital Output.
- Relay 1: Alarm

J6: RS232 port

J7: LCD connection.

J8: Power supply and signals from PSU board.

J9: System OK. Relay output.

7.0 USER CONFIGURATION

7.1 PSU BOARD

SW1: Dip switch setting.

This setting is recorded on board. It is factory set optimum for a particular search head assembly. This setting is fixed for the life of the detector unless the search head assembly is replaced by a new one. Prefer to dip switch setting section for setting procedure.

SW2: Frequency input.

Int: Use 2.048 MHz from psu board.
Ext: Use 2.000 Mhz from cpu board.
Factory setting is Int position. In the field choose the setting which gives the least background noise.

7.2 CPU BOARD

LK1, LK2: Use to set CPU to Bootstrap mode for factory EEPROM initialisation. In field operation these links have to be left open.

LK 4: ADC clock

1-2: 2.000 Mhz
2-3: 8.000 Mhz
Should be set at 2-3 position.

R20: LCD darkness

Adjust this potentiometer to obtain the right contrast for the LCD screen.

8.0 DIP SWITCH SETTING

The dip switches are used to optimise the performance of the Metal Detector for a particular search head coil. This setting is factory calibrated and should not be altered during normal operation. If however, the search head coil is damaged and replaced by a new one, re-calibration should be carried out for the new coil.

The procedure involves setting the Gate pulses delay and the Gate pulse duration on dip switches, using an oscilloscope.

1. Set oscilloscope horizontal time base to 250 uS/div.

2. Set CH1 to 20V/div and measure the wave-form at R29W. Set trigger to CH1 to obtain a stable waveform. This waveform is the Transmitted pulses.

3. Set CH2 to 2V/div and measure the wave-form at U10 pin 5. This is the Gate pulses.

4. Set DIP switch DLY to get **T1** approx. 50 uS (ref Fig.2). With a smaller T1, the Metal Detector will be more sensitive, but prone to false alarms. Larger T1 will have reverse effect, that is the detector will be less sensitive but more stable.

5. Set DIP switch DUR to get **T2** (ref fig.2) approx. 100 uS. Larger T2 increases sensitivity of the Metal Detector, but it will be more prone to false alarms. Smaller T2 has the reversed effect.

6. Record DIP switch setting to the white blank area above the switch.

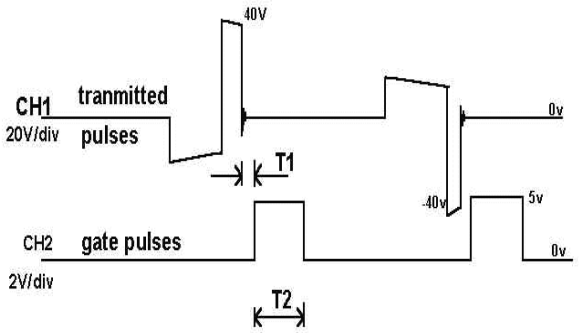


Figure 2. Oscilloscope viewing of Transmit and Gate pulses.

10.0 TECHNICAL SPECIFICATIONS

9.1 INSTALLATION

To achieve optimum Metal Detector performance, the following general rules should be considered during installation.

1. Keep the area around the search head clear of metal as much as possible.

2. Avoid magnetic loops around the search head area, especially intermittent loops created by conveyor rollers and steel structures assembled using nuts and bolts. Break the loop in conveyor rollers by insulating them at one end. If the loop in the conveyor frame is unavoidable, make it permanent using welded construction instead of bolted.

3. Minimise the effect of vibration on the search head by isolated it from the conveyor with rubber feet or bolt it to the firm ground.

4. Keep the search head as far as possible away from electro-magnetic interference sources such as power transformers, power cables, ac motor inverters, motors etc.

5. Install the Metal Detector electronics about 2-3m away from the search head.

9.2 COMMISSIONING

After installation, follow the procedures below fo commissioning:

1. Check all links and switches on electronic boards, make sure they are in their right positions, especially the 110V/240V switch.

2. Check all cables in and out of the electronic boards.

3. Turn the mains power on, and with the conveyor running with known clean (ie. no tramps) product on the belt, go to menu 2, step 1. Check the average signal 1 and 2 values and ensure they are in the range of -300 to +300.

4. Press Enter to go to step 2, observe the signal levels in both channels. They should be close to being equal in values.

5. Observe the signal level with only normal product moving under the detector, which is the noise level. Also observe the peak signal level as the belt splice travels through the detector. This is the belt splice signal level. Then go to menu 1, step 1 to set the normal threshold to a value slightly higher than the noise level observed, and step 2 to set the belt splice threshold slightly higher than the belt splice signal level observed. Refer to the menu 1 chapter in this manual to set these values.

6. Go to menu 7, step 1 and 2, enter the belt length and number of belt splices on the belt, then go back to step 0. Observe the actual belt speed with a belt speed indicator then enter this value to menu 1, step 3.

9.0 INSTALLATION AND COMMISSIONING

7. In menu 1, step 4 and 5, set the marker pulse width and belt stop delay. Time how long it takes for a point on the belt to travel from the detection area to the flag marker, and enter this time menu 1, step 6, so that when the marker is dropped, it will land on the tramp.

8. Go to menu 4, set date and time if necessary.

9. Pass the sample tramp metal over the belt to verify the detector operations. Adjust the threshold if necessary to achieve the desired sensitivity.

10. The Metal Detector is now ready for service.

10.0 TECHNICAL SPECIFICATIONS

Enclosures

IP66 NEMA 4X fibreglass

Dimensions: 320x270x180mm

Mounting: ....Vertical mounting only.

Shipping weight:.....

IP66 NEMA 4x Stainless steel.

Dimensions:.....400x400x280mm.

Mounting:.....Vertical mounting only.

Shipping weight:.....

Power Requirement

Mains supply: 240V,0.5A 50-60Hz

.....110V, 1A 50-60Hz

Mains supply voltage is switch selectable.

Search head

Length:.....300,600,900,1200mm

Transmit:..... .... ..Top, one coil.

Receiver:.Bottom, two dual wiring coils.

Distance from electronics:.....5m.max.

Digital Inputs

Quantity: 4

Supply voltage: .....33V DC

Sinking current: .....10mA.

Designation:

Reset button.

Belt splice sensor.

Marker off hook sensor.

Swing away sensor.

Relay Outputs

Quantity:.....3, identical.

Contact rating:....240Vac/dc @2A resistive.

Designation:

Marker relay.

Belt stop relay.

Alarm relay.

Status Relay Outputs

Contact rating: 40Vdc @0.5A resistive.

Printer Output

Serial, RS232 9600baud, 8bit data, 1 stop no parity.

Sensitivity

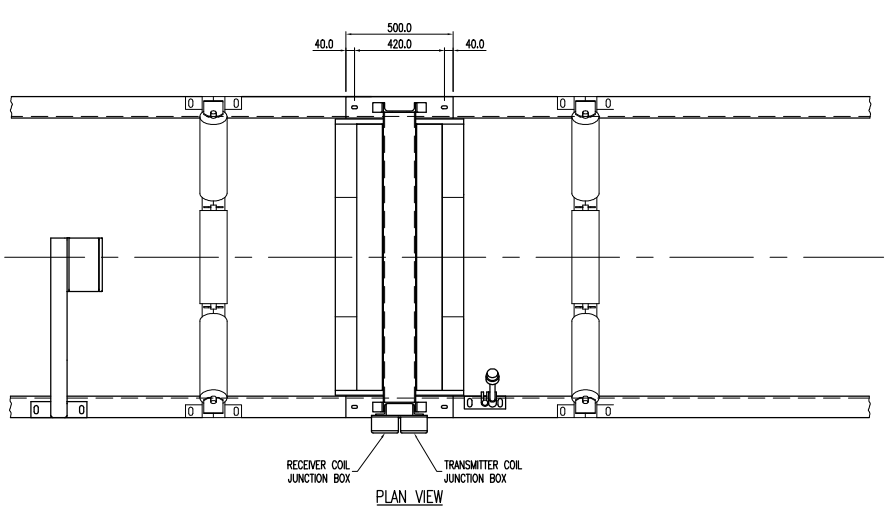
Minimum 20mm steel sphere.

Belt speed

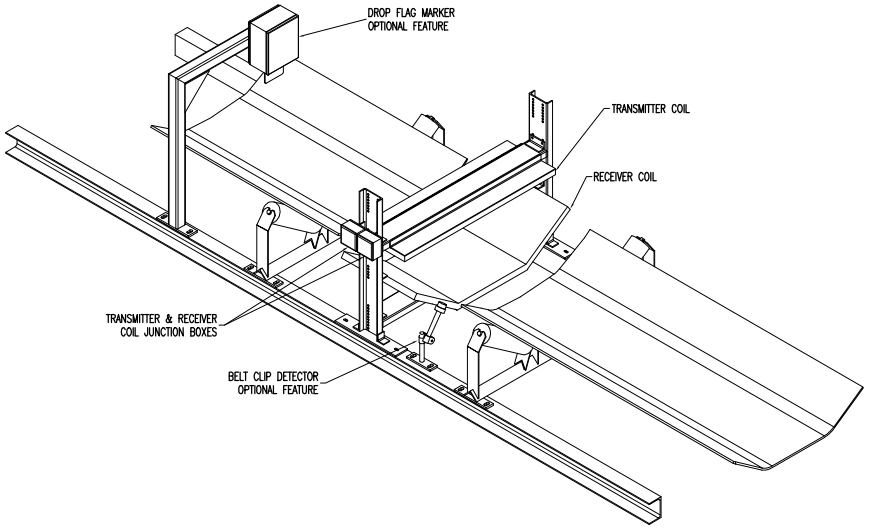
0.1-6.0m/s

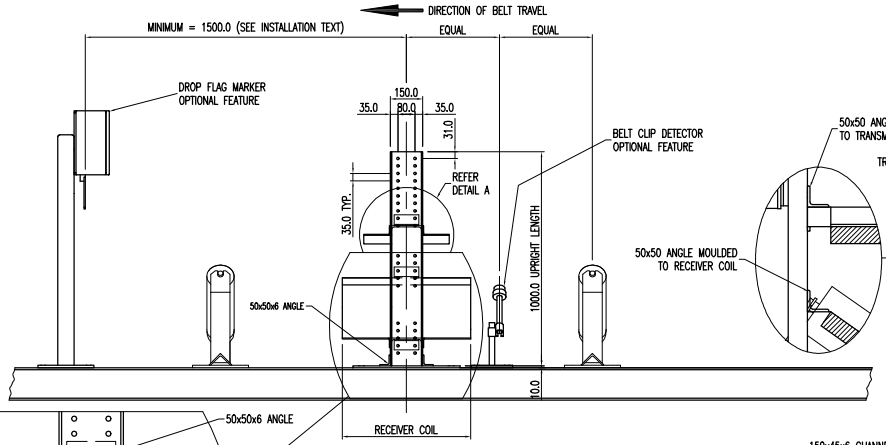
Environmental

Temperature: -10°C to 50°C continuously

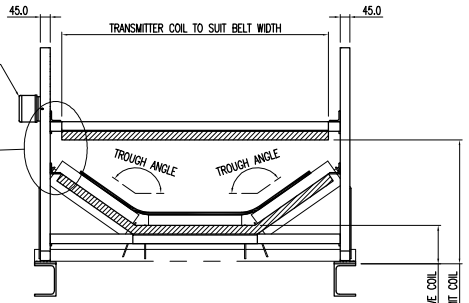


PLAN VIEW

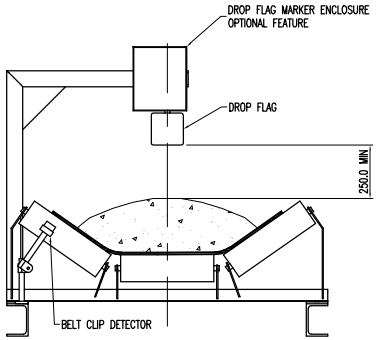




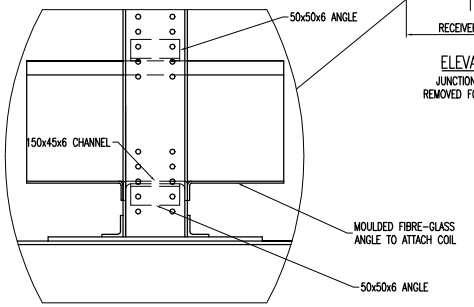
ELEVATION
JUNCTION BOXES REMOVED FOR CLARITY

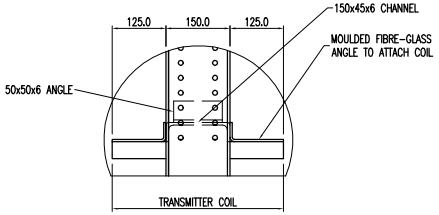


RIGHT SIDE VIEW



RIGHT SIDE VIEW
DROP FLAG MARKER





DETAIL A

REVISIONS		
A: 18/12/99 ORGINAL ISSUE	0000	T.BERNARDI
B: 29/03/99 JUNCTION BOXE DETAILS ADDED ECN: 0000		T.BERNARDI
C: 30/03/99 NOTE ADDED AT D2 BELT DIRECTION ARROW ENLARGED ECN: 0000		T.BERNARDI
D: 04/06/99 JUNCTION BOXES MOVED TO OPPOSITE SIDE, BELT CLIP DETECTOR MOVED CLOSER TO COILS ECN: 0000		T.BERNARDI
E: 12/11/01 SIDE DETAIL ADDED. ECN: 0000		T.BERNARDI

UNLESS OTHERWISE STATED UNTOLERANCED DIMENSIONS TO BE WITHIN THE LIMITS SHOWN					
NOMINAL SIZE	UP TO 50	ABOVE 50 UP TO 150	ABOVE 150 UP TO 300	ABOVE 300 UP TO 1000	ABOVE 1000
MACHINING	± 0.1	± 0.2	± 0.3	± 0.5	± 1.0
FABRICATION	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0
ASSEMBLIES	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0

DRAWN	TONY BERNARDI
CHECKED	-
APPROVED	-
DATE APP'D	-
SCALE	1:12.5

DO NOT SCALE IF IN DOUBT ASK

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

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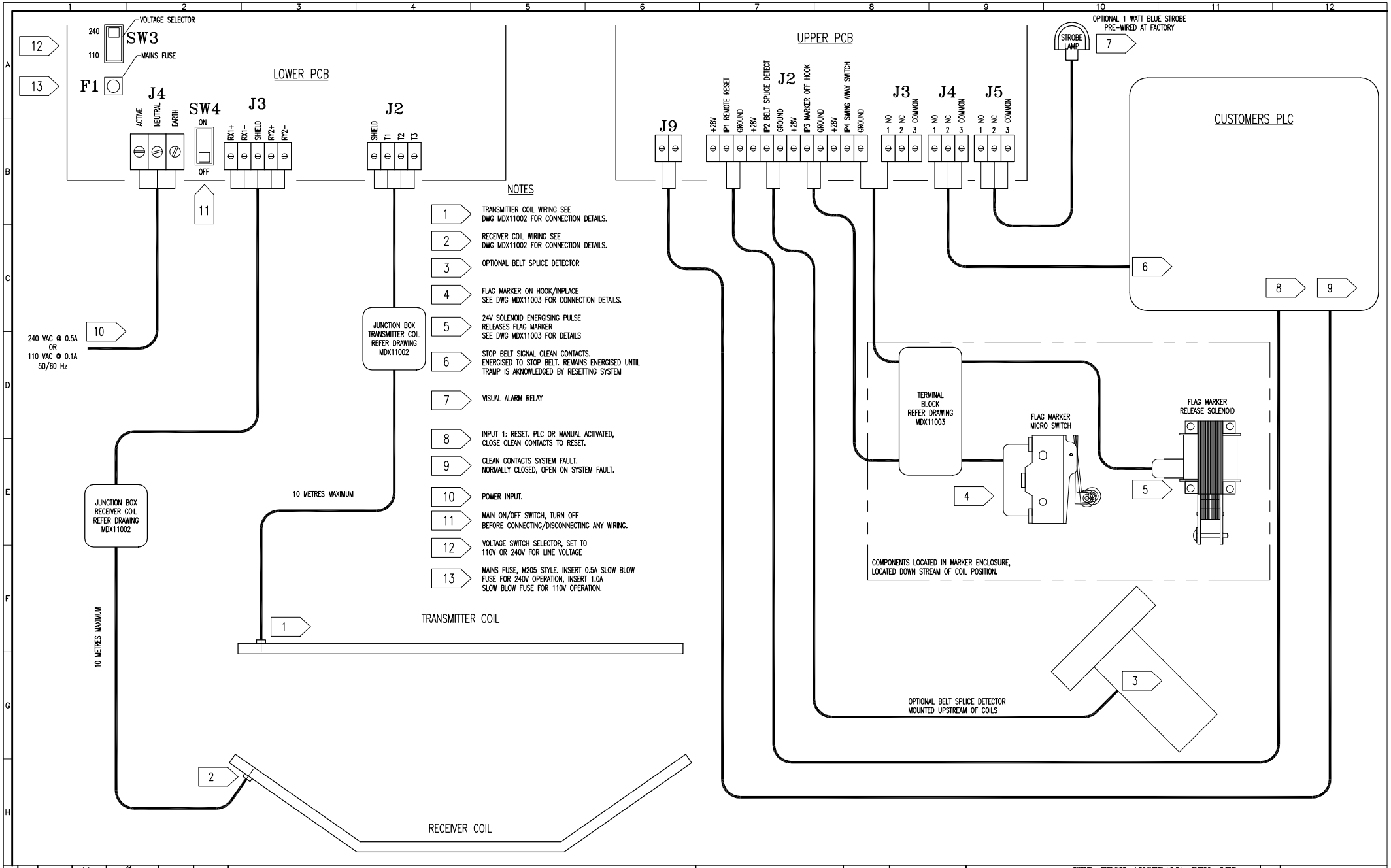
TITLE
WEB-TECH METAL DETECTOR MODEL MDX1 GENERAL ARRANGEMENT

SIZE A1

DRAWING No.
NUMBER MDX10100
REV. E

CUSTOMER –
PROJECT –
CAD FILE MDX10100



NOTES

1. TRANSMITTER COIL WIRING SEE DWG MDX11002 FOR CONNECTION DETAILS.
2. RECEIVER COIL WIRING SEE DWG MDX11002 FOR CONNECTION DETAILS.
3. OPTIONAL BELT SPLICE DETECTOR
4. FLAG MARKER ON HOOK/INPLACE SEE DWG MDX11003 FOR CONNECTION DETAILS.
5. 24V SOLENOID ENERGISING PULSE RELEASES FLAG MARKER SEE DWG MDX11003 FOR DETAILS
6. STOP BELT SIGNAL CLEAN CONTACTS. ENERGISED TO STOP BELT. REMAINS ENERGISED UNTIL TRAMP IS AKNOWLEDGED BY RESETTING SYSTEM
7. VISUAL ALARM RELAY
8. INPUT 1: RESET. PLC OR MANUAL ACTIVATED, CLOSE CLEAN CONTACTS TO RESET.
9. CLEAN CONTACTS SYSTEM FAULT. NORMALLY CLOSED, OPEN ON SYSTEM FAULT.
10. POWER INPUT.
11. MAIN ON/OFF SWITCH, TURN OFF BEFORE CONNECTING/DISCONNECTING ANY WIRING.
12. VOLTAGE SWITCH SELECTOR, SET TO 110V OR 240V FOR LINE VOLTAGE
13. MAINS FUSE, M205 STYLE. INSERT 0.5A SLOW BLOW FUSE FOR 240V OPERATION, INSERT 1.0A SLOW BLOW FUSE FOR 110V OPERATION.

REVISIONS

A: 18/02/99	ORIGINAL ISSUE 0000 T.BERNARDI
B: 30/03/99	DRAWING REFERENCE REMOVED FROM NOTE 8 ECN: 0000 T.BERNARDI
C: 17/05/99	JUNCTION BOX & TERMINAL BLOCK REFERENCE DRAWING ADDED ECN: 0000 T.BERNARDI
D: 04/06/99	NOTES BLOCK MODIFIED MAINS FUSE, VOLTAGE SELECTOR & ON/OFF SWITCH ADDED TO LOWER PCB ECN: 0000 T.BERNARDI
E: 12/11/01	J3 ON UPPER PCB NOW LABELLED J2 ECN: 0000 T.BERNARDI
F: 12/11/01	BLUE STROBE ADDED NOTE 7 MODIFIED ECN: 0000 T.BERNARDI

UNLESS OTHERWISE STATED UNTOLERANCED DIMENSIONS TO BE WITHIN THE LIMITS SHOWN						
NOMINAL SIZE	UP TO 50	ABOVE 50 UP TO 150	ABOVE 150 UP TO 300	ABOVE 300 UP TO 1000	ABOVE 1000	
MACHINING	± 0.1	± 0.2	± 0.3	± 0.5	± 1.0	
FABRICATION	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0	
ASSEMBLIES	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0	

DRAWN	TONY BERNARDI
CHECKED	–
APPROVED	–
DATE APP'D	–
SCALE	1:1

DO NOT SCALE IF IN DOUBT ASK

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

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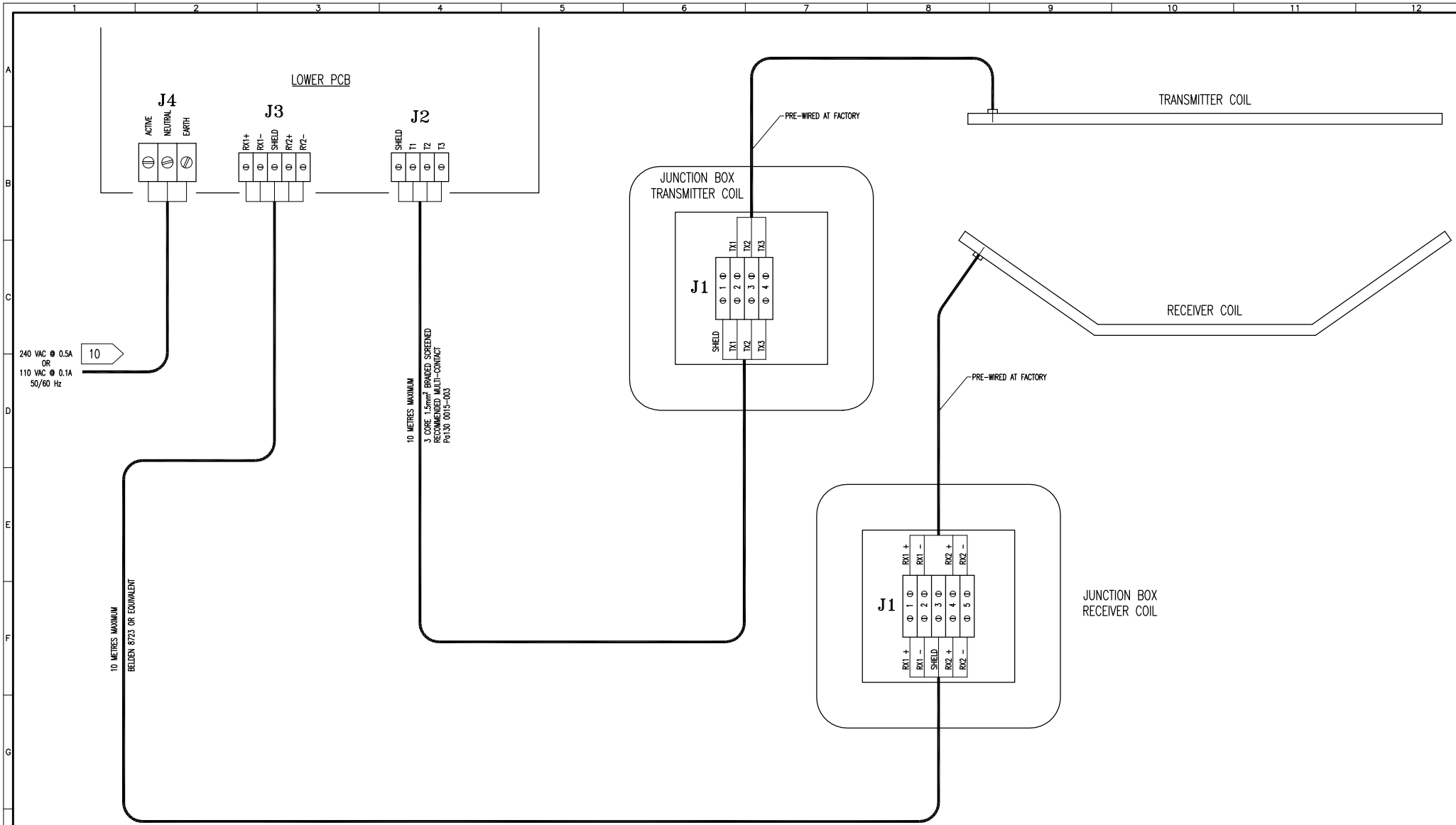
TITLE

WEB-TECH METAL DETECTOR MODEL MDX1 INTERCONNECTION & WIRING DIAGRAM

SIZE	A1
DRAWING No. NUMBER	MDX11001
REV.	G
CUSTOMER	–
PROJECT	–
CAD FILE	MDX11001



REVISIONS

A:	17/05/99 ORIGINAL ISSUE 0000	
B:	04/06/99 MAIN POWER INPUT ALTERED ECN: 0000	T.BERNARDI
C:	05/02/03 CABLE NOTES ADDED ECN: 0000	T.BERNARDI

UNLESS OTHERWISE STATED
UNTOLERANCED DIMENSIONS
TO BE WITHIN THE LIMITS SHOWN

NOMINAL SIZE	UP TO 50	ABOVE 50 UP TO 150	ABOVE 150 UP TO 300	ABOVE 300 UP TO 1000	ABOVE 1000
MACHINING	± 0.1	± 0.2	± 0.3	± 0.5	± 1.0
FABRICATION	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0
ASSEMBLIES	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0

DRAWN	TONY BERNARDI
CHECKED	–
APPROVED	–
DATE APP'D	–
SCALE	1:1

DO NOT SCALE
IF IN DOUBT
ASK

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SPECIFIED

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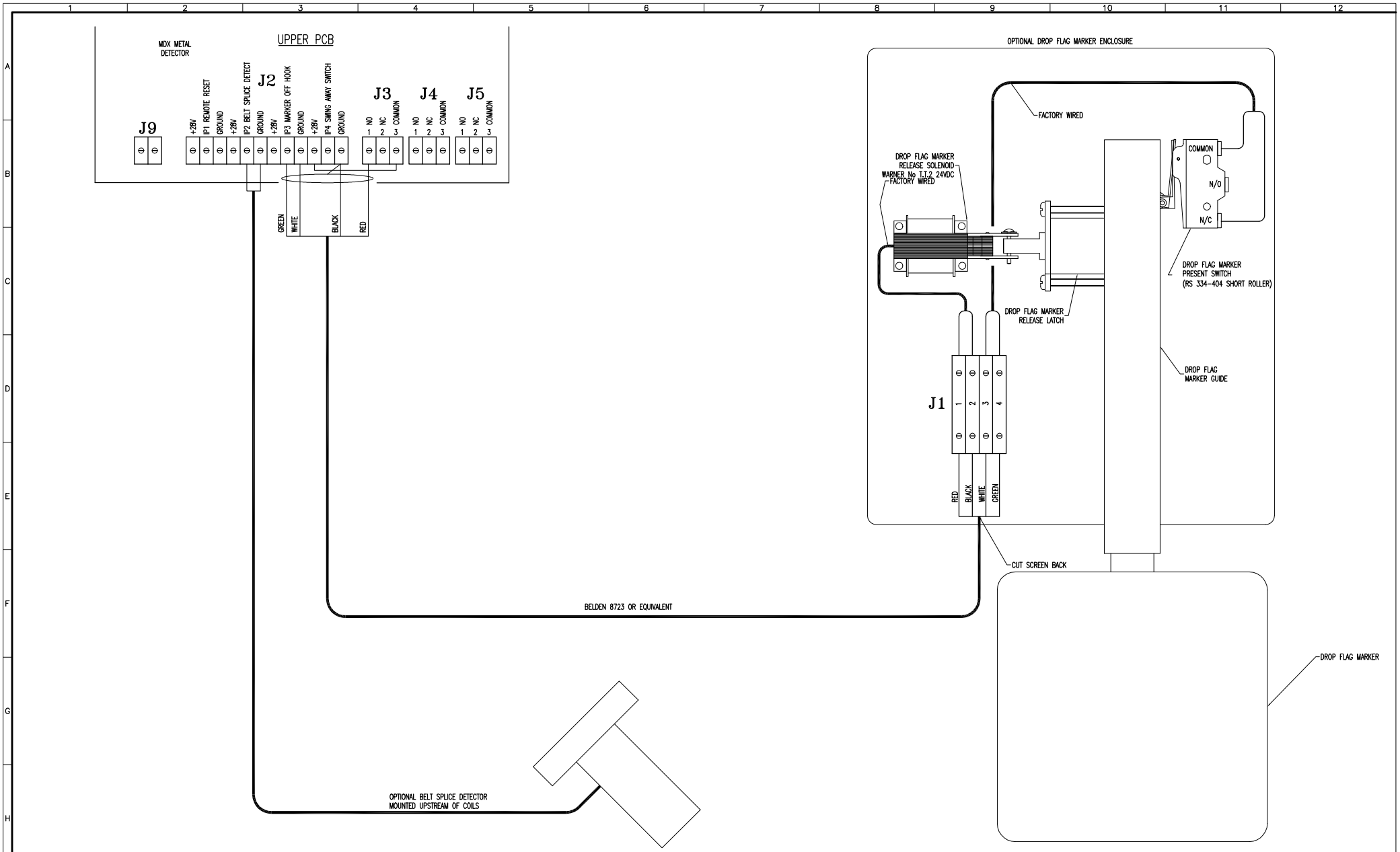
TITLE
WEB–TECH METAL DETECTOR
MODEL MDX1 – JUNCTION BOX
INTERCONNECTION & WIRING DIAGRAM

SIZE	DRAWING No. NUMBER	REV.
A1	MDX11002	C

CUSTOMER
–
PROJECT
CAD FILE
MDX11002



REVISIONS	
A: 23/12/99 ORIGINAL ISSUE 0000	
B: 26/03/99 WIRE COLOURS ADDED AT BJ, WIRING FOR MICRO-SWITCH ALTERED ECN: 0000	T.BERNARDI
C: 30/03/99 COMPONENTS LABELED DROP FLAG ADDED ECN: 0000	T.BERNARDI
D: 04/06/99 TEXT REVISION ECN: 0000	T.BERNARDI
E: 12/11/01 J3 ON UPPER PCB NOW LABELLED J2 ECN: 0000	T.BERNARDI

UNLESS OTHERWISE STATED UNTOLERANCED DIMENSIONS TO BE WITHIN THE LIMITS SHOWN

NOMINAL SIZE	UP TO 50	ABOVE 50 UP TO 150	ABOVE 150 UP TO 300	ABOVE 300 UP TO 1000	ABOVE 1000
MACHINING	± 0.1	± 0.2	± 0.3	± 0.5	± 1.0
FABRICATION	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0
ASSEMBLIES	± 0.5	± 0.5	± 0.5	± 1.0	± 2.0

DRAWN	TONY BERNARDI
CHECKED	-
APPROVED	-
DATE APP'D	-
SCALE	1:1

DO NOT SCALE IF IN DOUBT ASK

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

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TITLE
WEB-TECH METAL DETECTOR MODEL MDX – OPTIONAL FLAG MARKER INTERCONNECTION & WIRING DIAGRAM

SIZE A1 | DRAWING No. NUMBER MDX11003 | REV. E

CUSTOMER –

PROJECT –

CAD FILE MDX11003