

Digital Metal Detector DMD Rev 2.0 User Manual Release

Revision 1.0

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Document control

Revision history

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1. General

1.1 Brief Description

This document describes the general information about the Industrial Metal Detector Electronics PCB installation and commissioning with trouble shooting.

Physical dimensions are such that it can be retro fitted with the existing system with matched terminal numbers for external connections.

The search coil wiring remains same as per the retro-system with one significant change of tuning circuit parameter change.

1.2 Electronic Enclosure

The enclosure houses and protects the Electronic and serves as a junction box for conduit and cables running to and from the search coil.

As standard, the Detector PCB Electronics must be housed in a metal enclosure. There should be enough space in the box for all required components.

A cutout of adequate dimension needs to be cut on the side swing door of this panel for the display. Further details of the dimension of cutout are provided in the subsequent sections related to hardware installation.

1.3 Electronic PCB

The control unit consists of two different PCB. First one for the detection unit which includes all electronics for detection related components along with various inputs and outputs. Second PCB is the display unit which is mounted on the door of the panel.

Installation and various other detailed specifications will be described in the relevant sections of this document.

1.4 Operation

Detection Control unit has various settings which needs to be properly setup before commissioning of the system. Some of these parameters are factory set and other needs to be set in the field or during the actual onsite commissioning.

Hardware related setting scan be manipulated by onboard potentiometers and the jumpers. Software related parameters can be set using the display board buttons.

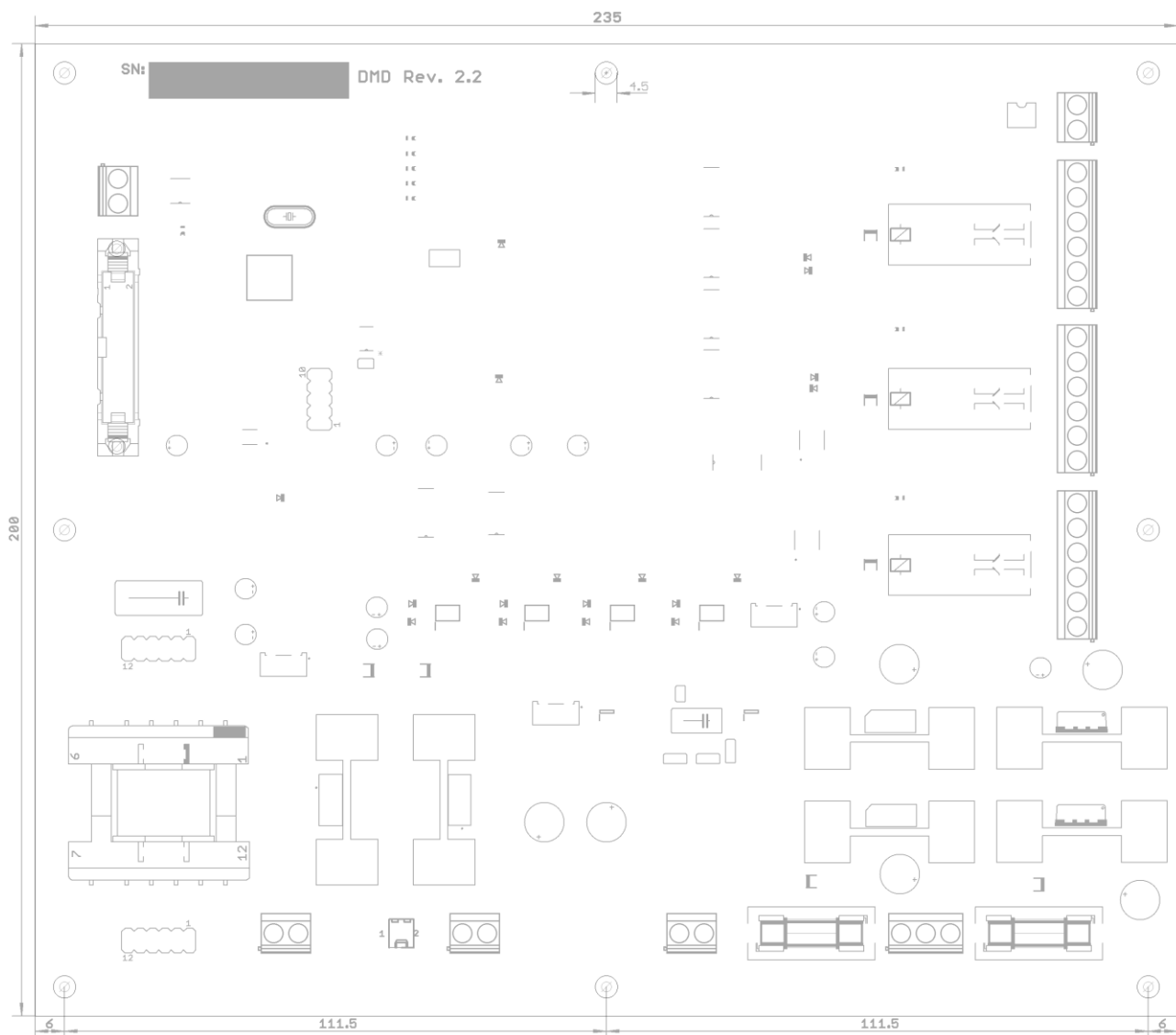
2. Technical Data

2.1 Performance Data

Operating Voltage:	+12 to 15V & -12 to 15V DC
Current Consumption:	1A each(Maximum)
Fuse:	1x 1000 mA, Fast Blow
Ambient Temperature:	Up to +50°C
Switching Inputs:	1x Remote Reset
Switching Outputs:	1 x Healthy / Fault (NO / NC 2x Changeover) 1 x Direct Output (NO / NC 2x Changeover) 1 x Timed Output (NO / NC 2x Changeover)
Operation:	Membrane keypad and display 4 line, 16 character display 6 Key Operations with Reset Button Healthy LED (Green) Fault/Detection LED (Red)
Detection Range:	25 mm Cube of Ferrous/ Non Ferrous metal (TX and RX coil vertical distance approx. 45 cm)

2.2 Dimension Data

2.2.1 Detector Unit



Length: 200 mm (Y-Direction)

Width: 235 mm (X-Direction)

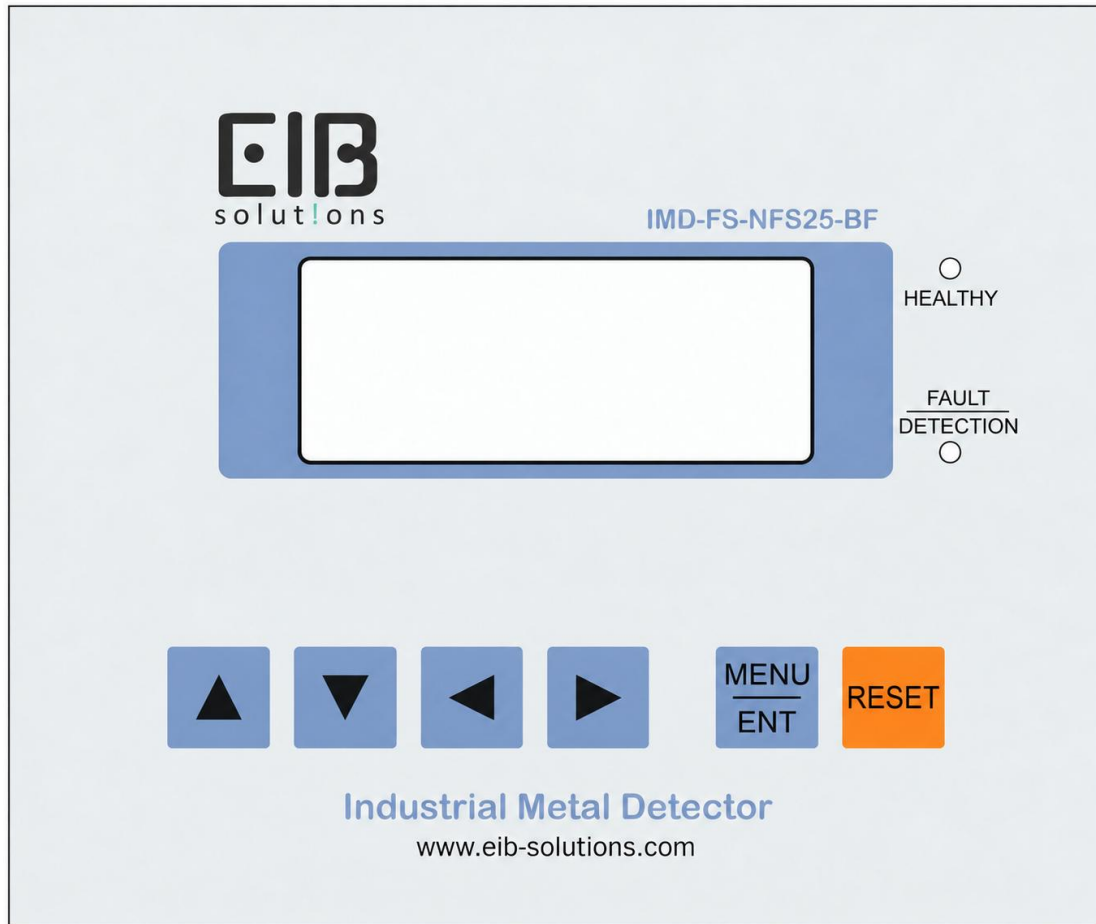
PCB Thickness: 1.6 mm

Total Height with Components: < 50 mm

Hole Diameter: 4 mm

Hole Center Edge Offset: 6mm

2.2.2 Display Unit



Length:	120 mm (Y-Direction)
Width:	140 mm (X-Direction)
PCB Thickness:	1.6 mm
Total Height with Components:	< 25 mm
Hole Diameter:	4 mm
Hole Center Edge Offset:	6mm
Cut Out Length	100.5 mm
Cut Out Width	120.5 mm

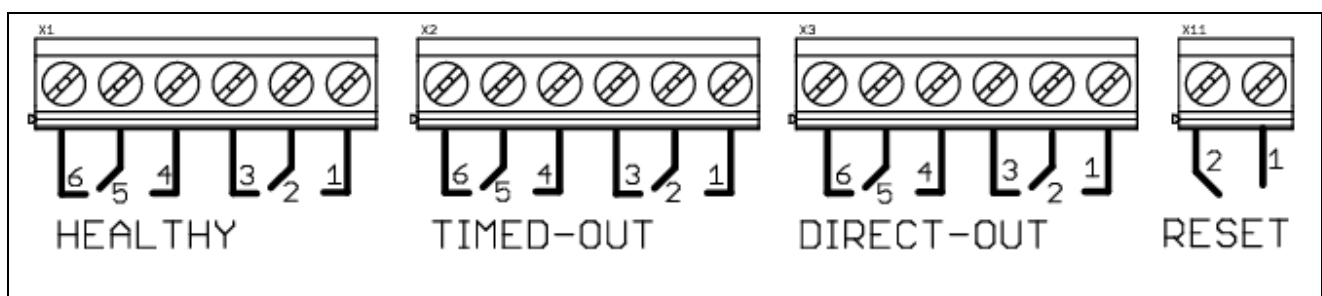
3. Terminal Details

3.1 Detector Unit Bottom Edge Connectors



Connector	Pin	Function	Additional Details
Power	-15V	Regulated Supply Input (-)	-15V/1A DC input
	GND	DC Supply Ground	0V / Ground
	+15V	Regulated Supply Input (+)	+15V/1A DC input
TX-OUT	16	TX-OUT Signal Pin (Output)	Transmitter Coil Positive connection
	0	TX-OUT Reference Pin (Output)	Transmitter Coil Reference connection
FB-IN	15	Feedback Signal Pin (Input)	Feedback Coil Positive connection
	0	Feedback Reference Pin (Input)	Feedback Coil Reference connection
RX-IN	17	RX-IN Signal Pin (Input)	Receiver Coil Positive connection
	0	RX-IN Reference Pin (Input)	Receiver Coil Reference connection

3.2 Detector Unit Right Edge Connectors



Connector	Pin	Function	Additional Details
X1	1,4	Direct Output Relay NO	Instantaneous Output after detection
	2,5	Direct Output Relay Common	
	3,6	Direct Output Relay NC	
X2	1,4	Delayed Output Relay NO	Delayed Output after detection

	2,5	Delayed Output Relay Common	
	3,6	Delayed Output Relay NC	
X3	1,4	Healthy Output Relay NO	Switches on if system is healthy after scanning various parameters
	2,5	Healthy Output Relay Common	
	3,6	Healthy Output Relay NC	
X11	1	External Detection Reset	Reset the detection by shorting the terminal 1 and 2
	2	External Detection Reset	

3.3 Detector Unit Display Connector

There is a 20 pin FRC connector with lock on board for connection with Display Unit.

3.4 Display Unit Connector

There is a 20 pin FRC connector with lock on board for connection with Detector Unit.

4. Operation

General advice for operation

- To operate the unit uses the UP, DOWN, LEFT, RIGHT, ENT/MENU and RESET keys.
- The key symbols displayed show that changes can be made in the choice of screen and also in the Value settings.
- The RESETY key returns the operator from any settings screen to the main screen.
- By pressing the Reset key the operator resets the machine manually after a metal event or any fault.

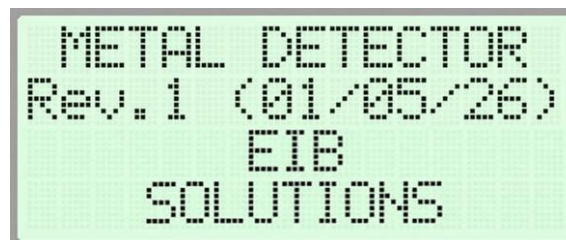
4.1 Display Screens

Following main screens are available during normal operation

1. Running / Normal Operation
2. Menu
3. Signal Level
4. View Configuration
5. Edit Configuration

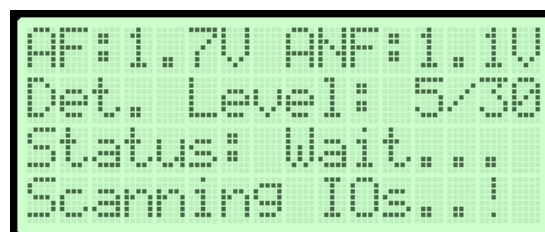
4.2 Splash Screen

After power-on and splash screen appears for brief period of time indicating successful power up.



4.3 Startup Screen

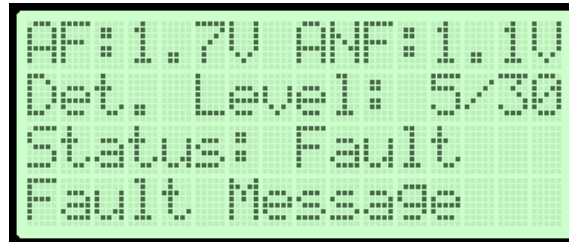
Once the splash screen disappears, system loads the IO check screen which looks for any fault in the system. Following screen appears during this process.



If the system has no fault, then it will proceed with normal operation which is described in the next section otherwise, it will give appropriate error message in line number 4 of the above screen and

the status will be changed to “Fault”. Please, refer below table for the error trouble shooting.

4.3.1 Fault Messages and Resolution



Please refer below table for fault type and its resolution description.

Fault Message	Description	Resolution
Freq Inte. Fault	Internal Sine Wave oscillator is not functioning and hence no input to the transmitter circuit	This fault cannot be rectified on site. Please contact OEM.
Freq Exte. Fault	Transmitter Feedback coil does not provide any feedback.	1. Check if the Transmitter coil is connected to the board connector 'X8' pin numbers 0 and 16. 2. Check the connection between the feedback coil and the board connector 'X3' pin numbers 0 and 15. 3. If connection is proper and the problem still persists then contact OEM.
Tx Output Open!	Transmitter Coil is not connected / improper connection. Detected transmitter amplitude is below 3V RMS.	1. Check if the Transmitter coil is connected to the board connector 'X8' pin numbers 0 and 16. 2. If connection is proper and the problem still persists then contact OEM.
Tx Out of Tuning	Transmitter Coil is connected but detected transmitter amplitude is below 12V RMS.	1. Transmitter coil tuning out of range. Transmitter amplitude must be between 12V and 17V RMS. 2. Contact OEM for further proper tuning.
Rx Input Open!	Receiver coil connection is Open.	1. Check the connection between the Receiver coil and the board connector 'X7' pin number 0 and 17. 2. If connection is proper then check the voltage level on the test point TP20. Minimum voltage level needs to be 50 mV RMS. 3. If connection is proper and the problem still persists then contact OEM.

Metal Detected!!	Metal detected under healthy/normal operation	Press reset button to clear the detection.
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4.4 Running Screen (Normal Operation)

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AF:1.7V ANF:1.1V
Det. Level: 5/30
Status: Healthy

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```

AF:1.7V ANF:1.1V
Det. Level: 5/30
Status: Healthy
Metal Detected!!

```

Parameter	Description	Additional Details
AF	Amplitude of Ferrous metal signal	
ANF	Amplitude of Non-Ferrous metal signal	
Det. Level	Current detection level in % / Programmed detection level threshold	Detection when current level is greater then programmed level.
Status	If the system is healthy then displays healthy else fault	
empty line / Metal Detected!!	Message based upon status. If Fault the description is displayed regarding fault in this line else the metal detected is displayed.	

4.5 Menu Screen

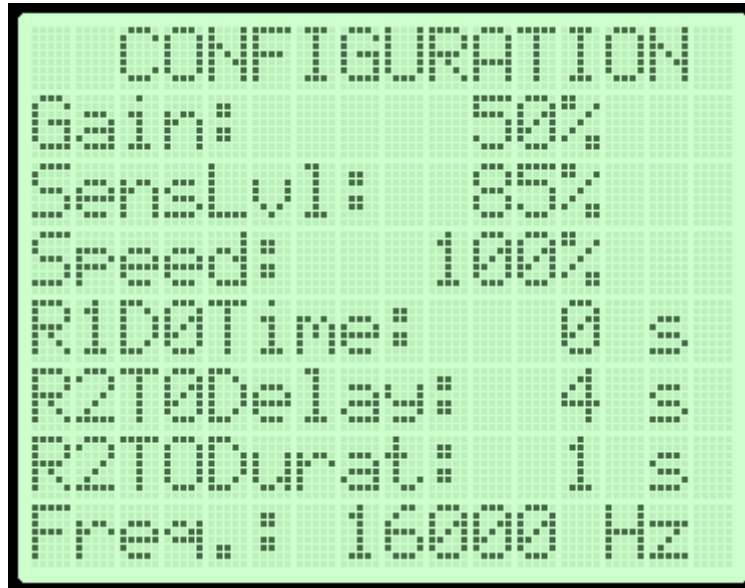
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MAIN MENU
> 1.View Config
  2.Signal Level
  3.Edit Config
  4.Exit Menu

```

By pressing “MENU | ENT” button, one can go to main menu screen. Use “Up” and “Down” arrow keys to navigate between different options. Cursor ‘>’ will move along with key press. By pressing “MENU | ENT” key you can enter the selected view.

4.6 View Configuration Screen



Current configuration can be viewed in this screen. Use up and down arrow keys to navigate between different parameters. Only 3 parameters will be visible at a time as we only have 4 Line LCD.

Parameter	Description	Additional Details
Gain	Overall system gain	Overall input gain of the receiver system. Factory set parameter. Cannot be modified.
SensLvl	Sensitivity level (1 – 100 %)	If this parameter is set to 85%, the system will detect at or greater the 15% threshold.
Speed	Overall speed of detection (1 – 100%)	Depending upon conveyor speed, increase or decrease this parameter to match the faster moving target detection. Factory set parameter. Cannot be modified.
R1D0Time	Direct Relay Output On Time in seconds	0: Always on after detection (Reset by pressing reset button) – Sticky Output 1-999: Auto reset after programmed seconds.
R2T0Delay	Timed Out Relay On Delay in seconds	Timed Out relay will switch on after this many programmed seconds. 0-999 seconds.
R2T0Durat	Timed Out Relay Rejection Duration in seconds	Timed Out relay will be switched off after this many programmed seconds.

		0-999 seconds
Freq.	System Working Frequency	Factory set parameter. Cannot be modified.

4.7 Edit Configuration Screen

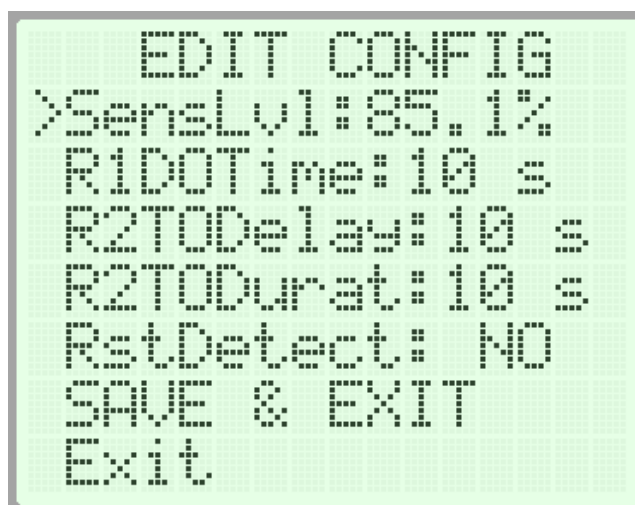
Before you can enter the Edit configuration screen, you have to provide valid password. Following screen will appear for password check.



User the up and down arrow keys to change the character and left and right arrow keys to change position to next or pervious. Press enter once you have entered proper password.

Default user password is “ABCD”.

Following configuration screen will appear based upon the privileged access levels. We are only going to described general screen for user level access. Use the up and down arrow key to select parameter indicated by curser '>'. Use left and right arrow key to change the value of selected parameter.

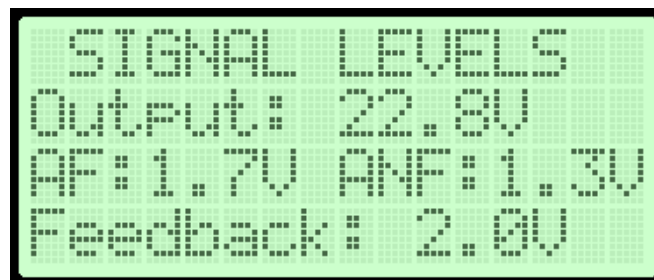


Parameter	Description	Additional Details
SensLv1	Sensitivity level in Percentage	User Setting range is 1 to 99%
R1DOTime	Direct Relay Output On Time in seconds	0: Always on after detection (Reset by pressing reset button) – Sticky Output 1-999: Auto reset after programmed seconds.
R2TODelay	Timed Out Relay On Delay in seconds	Timed Out relay will switch on after this many programmed seconds. 0-999 second.

R2TODurat	Timed Out Relay Rejection Duration in seconds	Timed Out relay will be switched off after this many programmed seconds. 0-999 seconds
RstDetect.	Reset the Master detection Counter	Yes or No. Yes will reset the master detection counter.
Save & Exit	Save the modifications and exit	Press MENU ENT key to select this option
Exit	Exit without saving	Press MENU ENT key to select this option

4.8 Signal Level Screen

This is a diagnostics screen. One can see if the system has proper input and output levels or not for efficient functioning.



Parameter	Description	Additional Details
Output	Amplitude of Transmitter signal as RMS value in mV	Must be > 12000 mV
AF	Amplitude of Ferrous Receiver signal as RMS value in mV	Must be > 400 mV
ANF	Amplitude of Non-Ferrous Receiver signal as RMS value in mV	Must be > 400 mV
Feedback	FB signal amplitude on terminal 0 & 15	Must be > 1V