DIGIT MXP DISPLAY

USER'S MANUAL

REV-11-1113-UM-00

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1 DIGIT OVERVIEW

The REV Robotics Digit MXP Display is a digital display inspired by FRC Hall of Fame Team 1538 - The Holy Cows and their 2015 custom MXP board. It is designed to plug into the roboRIO MXP (myRIO Expansion Port). An I^2C driver chip is the interface between the roboRIO and the four 15-segment LED displays, thus minimizing the number of digital I/O used. Two user buttons and a potentiometer are also included to give basic user input to the roboRIO.

Every MXP signal is broken out to a pass-through connector which allows for additional MXP boards to be connected.

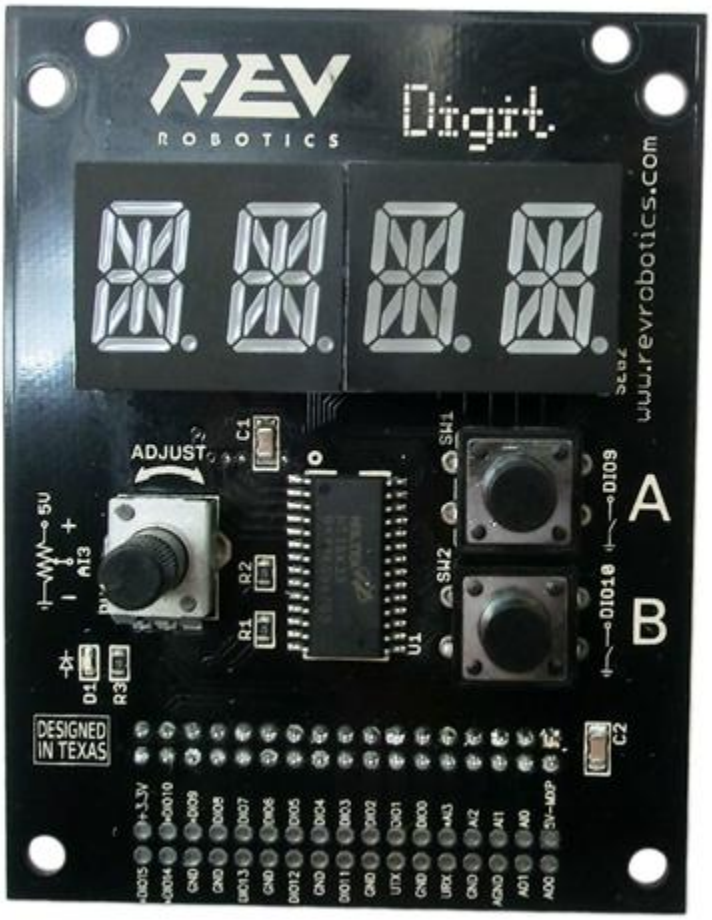


Figure 1-1 Digit MXP Display

1.1 FEATURE SUMMARY

The Digit MXP Display provides the following features:

- 4 15-segment LED displays
- HT16K33 LED Driver
  - I^2C interface
  - 16-step dimming
- 2 user buttons and 1 potentiometer
  - Digital and analog user input
- All MXP signals are passed through to 0.1" pitch connector
  - Only 5 MXP signals are used by the Digit
    - DIO14/I2CSCL
    - DIO15/I2CSDA
    - DIO9
    - DIO10
    - AI3
  - Besides power and ground, remaining signals are pass-through only
  - Use additional MXP boards with an extension cable
- Mounting holes
  - 2 holes for roboRIO mounting
  - 4 holes for additional mounting options,

1.2 APPLICATIONS

- Sensor data display
  - Field alignment
  - Mechanism positioning
  - Field calibration
- Autonomous mode selection
  - Last minute strategic changes
- Real-time parameter adjustment
  - PID tuning
- Diagnostics display
  - Battery voltage
  - Pneumatic pressure
  - Robot state
  - Error codes

1.3 KIT CONTENTS

The following items are included with each Digit MXP Display:

- 1 - Digit MXP Display
- 1 - Female MXP connector
- 2 - roboRIO mounting screws, 4-40 x 3/16"

2FEATURE DESCRIPTION

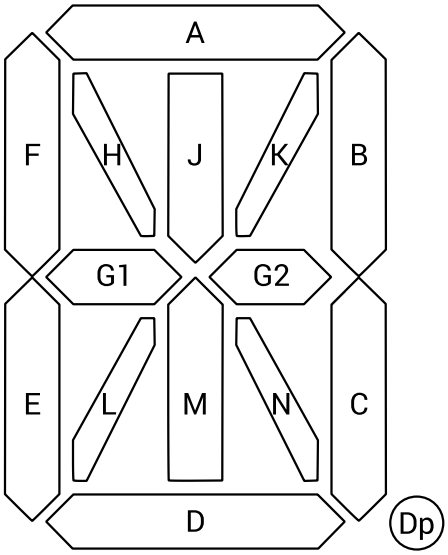
The REV Robotics Digit MXP Display includes a range of features designed specifically for use on *FIRST®* Robotics Competition robots. Each feature is described in detail throughout the following sections.

2.1 SEGMENTED LED DISPLAYS

The Digit MXP Display has four 15-segment LED displays across its top allowing for four alphanumeric characters to be shown at once.

All four displays are controlled by a single HT16K33 driver chip. The HT16K33 is an I^2C enabled LED matrix controller. It can control a maximum matrix size of 8 X 16, however the Digit only consists of an equivalent 4 X 15 matrix. Each segment within a character is considered a row (ROWn), and each character is its own column, or common (COMn). TABLE XXX shows the segment mapping for each character display.

Table 2-1 Segment and Character Mapping

Segment	Row Signal	
A	ROW14	
B	ROW 12	
C	ROW 11	
D	ROW 10	
E	ROW 0	
F	ROW 2	
G1	ROW 9	
G2	ROW 8	
H	ROW 3	
J	ROW 5	
K	ROW 7	
L	ROW 6	
M	ROW 4	
N	ROW 1	
Dp	ROW 13	

Character Mapping				
Board Orientation	**Character 4**	**Character 3**	**Character 2**	**Character 1**
Common Signal	COM3	COM2	COM1	COM0

Control commands and data can be sent to the controller chip via I^2C. The Digit is connected to the roboRIO I^2C lines listed in TABLE XXX below.

Table 2-2 I^2C Signals

roboRIO Signal	MXP Pin	HT16K33 Signal
DIO14/I2CSCL	32	SCL
DIO15/I2CSCL	34	SDA

For more detailed information on communicating with the HT16K33 and example roboRIO code, please see the Digit MXP Display product page at www.revrobotics.com/product/digit-mxp-display.

2.2 USER INPUT

With its user buttons and a potentiometer, the Digit MXP Display can provide a method of sending simple digital and analog information to the roboRIO.

2.2.1 USER BUTTONS

Two user buttons are located below the LED displays. The buttons are connected to two digital inputs on the roboRIO MXP. When pressed, the buttons short the input pin to ground. Table XXX shows which MXP signals are connected to the user buttons.

Table 2-3 User Button Signals

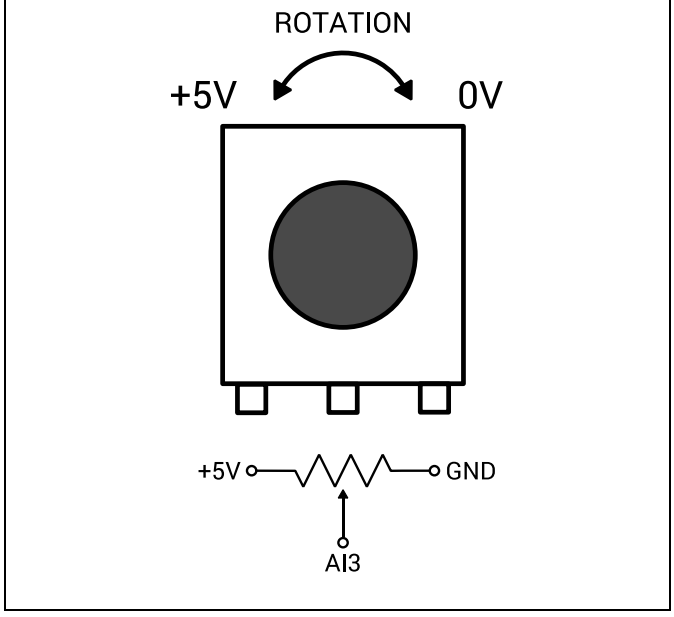
roboRIO Signal	MXP Pin	Digit Button
DIO9/PWM5	29	A
DIO10/PWM6	31	B

2.2.2 POTENTIOMETER

The Digit MXP Display includes a single-turn 8.75kΩ potentiometer located below the LED displays. It provides a method to set an analog input to the roboRIO. The potentiometer wiper sweeps through 0V to 5V over the full turning range of the shaft. When turned in the clockwise direction, the voltage at the wiper approaches 0V. When turned in the counterclockwise direction, the voltage at the wiper approaches 5V. Table XXX shows this in more detail.

Table 2-4 Potentiometer Signals and Configuration

roboRIO Signal	MXP Pin	Digit Signal
AI3	9	Potentiometer Wiper

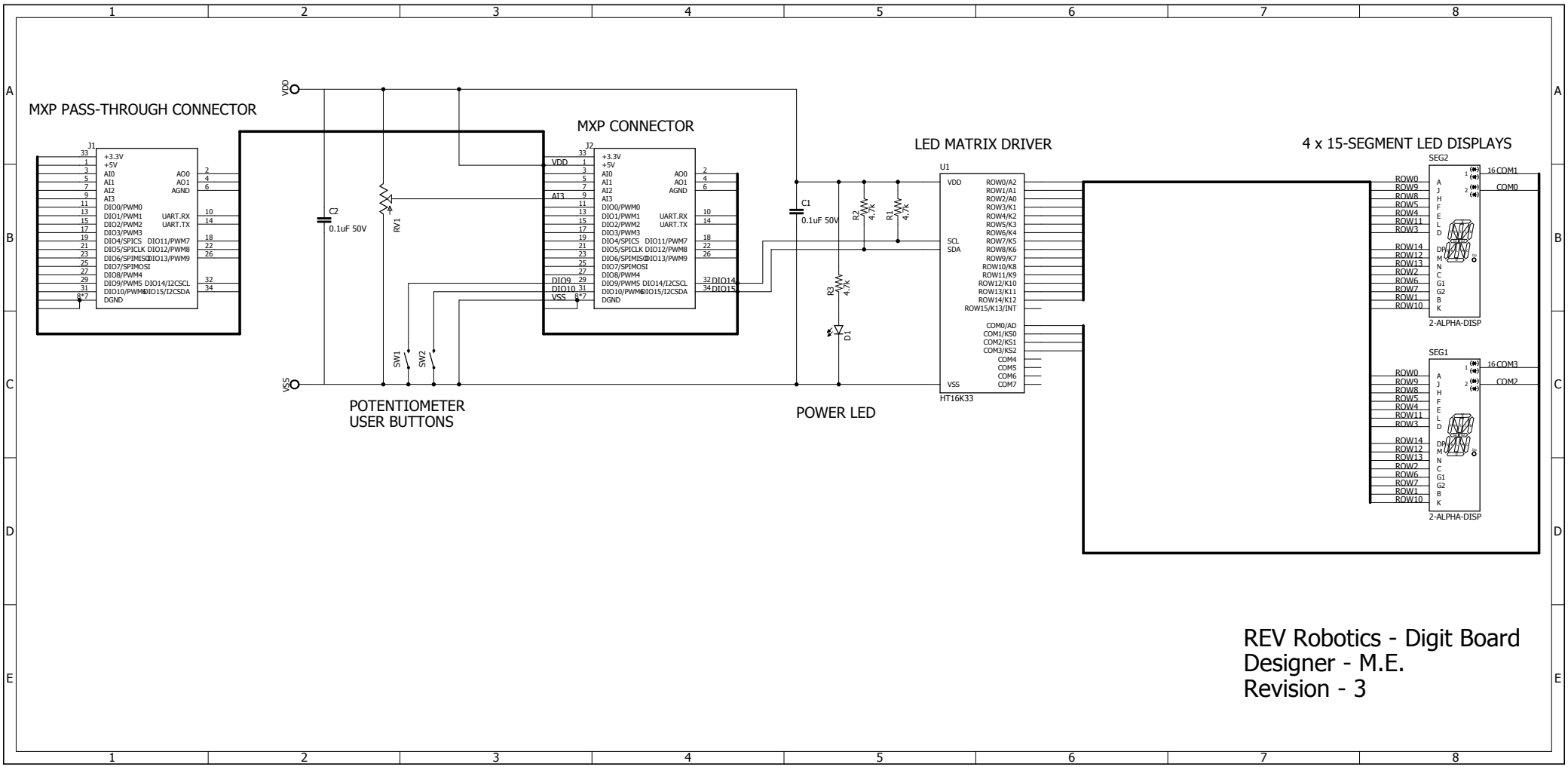


2.3 MXP PASS-THROUGH CONNECTOR

All MXP signals are routed to a 2x17 0.1" spaced grid of holes along the bottom edge of the board. The included female MXP connector can be soldered to these holes and used in tandem with the REV Robotics MXP Extension Cable (REV-11-1118) to stack an additional MXP board like the REV More Board (REV-11-1100).

APPENDIX A SCHEMATIC

Appendix A shows the schematic for the REV Robotics Digit MXP Display.


MXP PASS-THROUGH CONNECTOR
MXP CONNECTOR
LED MATRIX DRIVER
4 x 15-SEGMENT LED DISPLAYS
POTENTIOMETER
USER BUTTONS
POWER LED
HT16K33
2-ALPHA-DISP
REV Robotics - Digit Board
Designer - M.E.
Revision - 3