7
Referências Bibliográficas


Apêndice I

Especificações dos motores *Banebots* utilizados na automatização da mesa coordenada XYθ, apresentado na Figura 20.

<table>
<thead>
<tr>
<th>Physical</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Planetary</td>
</tr>
<tr>
<td>Reduction</td>
<td>16:1</td>
</tr>
<tr>
<td>Stages</td>
<td>2</td>
</tr>
<tr>
<td>Gear Material</td>
<td>All Metal</td>
</tr>
<tr>
<td>Weight (Gearbox only)</td>
<td>6.2 oz (174g)</td>
</tr>
<tr>
<td>Weight (with motor)</td>
<td>11.6 oz (327g)</td>
</tr>
<tr>
<td>Length (Gearbox only)</td>
<td>1.6 in (40mm)</td>
</tr>
<tr>
<td>Length (with motor)</td>
<td>3.7 in (93mm)</td>
</tr>
<tr>
<td>Width (Square)</td>
<td>1.5 in (38mm)</td>
</tr>
<tr>
<td>Shaft Diameter</td>
<td>0.375 in (10mm)</td>
</tr>
<tr>
<td>Shaft Length</td>
<td>2.15 in (55mm)</td>
</tr>
<tr>
<td>Shaft Key</td>
<td>0.125 in (3.2mm)</td>
</tr>
<tr>
<td>Shaft End Tap</td>
<td>#8-32</td>
</tr>
<tr>
<td>Mounting Holes (12)</td>
<td>#10-32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculated Performance*</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Motor</td>
<td>RS-540 (Pinion)</td>
</tr>
<tr>
<td>Operating v</td>
<td>4.5v – 12v</td>
</tr>
<tr>
<td>Nominal v</td>
<td>12v</td>
</tr>
<tr>
<td>No Load RPM</td>
<td>1050</td>
</tr>
<tr>
<td>No Load A</td>
<td>1º</td>
</tr>
<tr>
<td>Stall Current</td>
<td>42º</td>
</tr>
<tr>
<td>Stall Torque</td>
<td>632 oz-in 4461 mN-m</td>
</tr>
<tr>
<td>Kt</td>
<td>15 oz-in/A 106 mN-m/A</td>
</tr>
<tr>
<td>kV</td>
<td>88 rpm/v</td>
</tr>
<tr>
<td>RPM - Peak Eff</td>
<td>908</td>
</tr>
<tr>
<td>Torque - Peak Eff</td>
<td>99.3 oz-in 701 mN-m</td>
</tr>
<tr>
<td>Current - Peak Eff</td>
<td>6.6º</td>
</tr>
</tbody>
</table>
Esquema do Motor:

**BANEBOOTS 36mm GEARBOX**

**RINGGEAR LENGTH**
- 1 STAGE: 0.44
- 2 STAGE: 0.77
- 3 STAGE: 1.11
- 4 STAGE: 1.44

**Mounting Holes:**
- #10-32
- 12 Total
- 4 Top, 4 Bottom, 4 Face

** Shaft Notes:**
- 0.375 diameter
- Keyway: 0.125 Keyway
- 0.30 from end of shaft, 1.55 Long
- End Tap #8-32, 375" Deep

**ALL DIMENSIONS INCHES**
**NO HIDDEN LINES SHOWN**

-0.300
-0.150
0.000
-0.150
0.000
2.15
-1.350
-1.500
-1.125
-1.500
-0.375
-0.000
-0.000
-0.000
-0.000
-0.000
Apêndice II

Datasheet do microcontrolador PIC 16F767, utilizado no sistema eletrônico da mesa coordenada, e apresentado na Figura 25.

Low-Power Features:
- Power-Managed modes:
  - Primary Run (XT, RC oscillator, 76 μA, 1 MHz, 2V)
  - RC_RUN (7 μA, 31.25 kHz, 2V)
  - SEC_RUN (9 μA, 32 kHz, 2V)
  - Sleep (0.1 μA, 2V)
- Timer1 Oscillator (1.8 μA, 32 kHz, 2V)
- Watchdog Timer (0.7 μA, 2V)
- Two-Speed Oscillator Start-up

Oscillators:
- Three Crystal modes:
  - LP, XT, HS (up to 20 MHz)
- Two External RC modes
- One External Clock mode:
  - ECLK (up to 20 MHz)
- Internal Oscillator Block:
  - 8 user-selectable frequencies (31 kHz, 125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 8 MHz)

Analog Features:
- 10-bit, up to 14-channel Analog-to-Digital Converter:
  - Programmable Acquisition Time
  - Conversion available during Sleep mode
- Dual Analog Comparators
- Programmable Low-CURRENT Brown-out Reset (BOR) Circuitry and Programmable Low-Voltage Detect (LVD)

Peripheral Features:
- High Sink/Source Current, 25 mA
- Two 8-bit Timers with Prescaler
- Timer1/RTC module:
  - 16-bit timer/counter with prescaler
  - Can be incremented during Sleep via external 32 kHz watch crystal
- Master Synchronous Serial Port (MSSP) with 3-wire SPI™ and I^{2}C™ (Master and Slave) modes
- Addressable Universal Synchronous Asynchronous Receiver Transmitter (AUSART)
- Three Capture, Compare, PWM modules:
  - Capture is 16-bit, max. resolution is 12.5 ns
  - Compare is 16-bit, max. resolution is 200 ns
  - PWM max. resolution is 10 bits
- Parallel Slave Port (PSP) – 40/44-pin devices only

Special Microcontroller Features:
- Fail-Safe Clock Monitor for protecting critical applications against crystal failure
- Two-Speed Start-up mode for immediate code execution
- Power-on Reset (POR), Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Programmable Code Protection
- Processor Read Access to Program Memory
- Power-Saving Sleep mode
- In-Circuit Serial Programming™ (ICSP™) via two pins
- MPLAB® In-Circuit Debug (ICD) via two pins
- MCGR pin function replaceable with input only pin

<table>
<thead>
<tr>
<th>Device</th>
<th>Program Memory (# Single-Word Instructions)</th>
<th>Data SRAM (Bytes)</th>
<th>I/O</th>
<th>Interrupts</th>
<th>10-bit A/D (ch)</th>
<th>CCP (PWM)</th>
<th>CCPTM</th>
<th>MSSP</th>
<th>SPI™</th>
<th>µCPTM</th>
<th>AUSART</th>
<th>Timers 8/16-bit</th>
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<tbody>
<tr>
<td>PIC16F737</td>
<td>4096</td>
<td>384</td>
<td>26</td>
<td>16</td>
<td>11</td>
<td>2</td>
<td>3</td>
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<tr>
<td>PIC16F767</td>
<td>8192</td>
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<td>Yes</td>
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<td>Yes</td>
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</tbody>
</table>
QFN (28-pin)
Apêndice III

Esquema da placa eletrônica utilizada no trabalho (Figura 25).