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INTRODUCTION

The Wyle Scientific is a digital electronic calculator with a delay line memory capable of operating on six fixed-length registers and performing addition, subtraction, multiplication, division, and square root extraction functions. Operational input is via a 38-key keyboard and output is displayed in a CRT presentation of the contents of all memory registers.

Provision has been made for addition and connection of external peripheral systems including input, programming, and memory devices.

This manual contains operational, programming, and maintenance information for the Wyle Scientific Model WS-02 and is summarized as follows:

Section I: Operating Instructions
Detailed explanation of keyboard functions, data display identification, and associations used in programming.

Section II: Theory of Operation
Complete functional analysis of operations performed by the calculator with reference to block and flow diagrams.

Section III: Performance Procedure and Malfunctions Symptoms
A keyboard test program is provided to functionally check the calculator for correct operation. Malfunction symptoms and possible causes are listed in tabular form.

Section IV: Disassembly, Alignment, and Adjustment Procedures
Step-by-step instructions for removal and/or replacement of special assemblies or components are outlined. Critical alignment procedures of the read and write circuits and of the delay line, and adjustments of the special display circuits are included.

Section V: Parts List
Component types and values are listed for replacement purposes.

Section VI: Schematics and Drawings
Wiring diagrams and schematics of all printed circuit boards with associated flow diagrams are included.
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Type</td>
<td>Electronic desk calculator</td>
</tr>
<tr>
<td>Memory</td>
<td>4.85-millisecond magneto-strictive delay line</td>
</tr>
<tr>
<td>Number of Registers</td>
<td>Three arithmetic and three storage registers. (Up to 24 additional storage registers are available as peripheral equipment.)</td>
</tr>
<tr>
<td>Length of Registers</td>
<td>Twenty-four digits</td>
</tr>
<tr>
<td>Decimal Point</td>
<td>Automatic and presentable by operator</td>
</tr>
<tr>
<td>Negative Sign</td>
<td>Nine's complement</td>
</tr>
<tr>
<td>Logic Elements</td>
<td>Solid state</td>
</tr>
<tr>
<td>Functions Available</td>
<td>Add, Subtract, Clear and Multiply, Multiply Plus, Multiply Minus, Division, Square Root Extraction, Shift Left, Shift Right, Back Space, Forward Space, Transfer, Clear Registers, Numeral Entry, Decimal Point Alignment</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>105/125 vac, 60 cycles, 170 watts</td>
</tr>
<tr>
<td></td>
<td>220/260 vac, 50 cycles, 170 watts*</td>
</tr>
<tr>
<td></td>
<td>90/110 vac, 50 cycles, 170 watts*</td>
</tr>
<tr>
<td>Peripheral Connector</td>
<td>Winchester Part MRA104S (104-pin)</td>
</tr>
</tbody>
</table>

*Optional on special order
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<table>
<thead>
<tr>
<th>Speed of Operations</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Subtract</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Multiply*</td>
<td>Less than 1 second</td>
</tr>
<tr>
<td>Divide*</td>
<td>Less than 1 second</td>
</tr>
<tr>
<td>Square Root*</td>
<td>Less than 1 second</td>
</tr>
<tr>
<td>Decimal Point</td>
<td></td>
</tr>
<tr>
<td>Alignment*</td>
<td>Less than 0.2 second</td>
</tr>
<tr>
<td>Shift Left</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Shift Right</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Back Space</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Forward Space</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Transfer</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Clear Register</td>
<td>4.8 milliseconds</td>
</tr>
<tr>
<td>Numeral Entry</td>
<td>4.8 milliseconds</td>
</tr>
</tbody>
</table>

Peripheral Equipment (Optional):

- Punched Card Programmer PC-01
- Patch Board Programmer PB-02 (maximum of 512 program steps)
- Supplemental Memory Register SM-01 or SM-02 (8 to 24 additional registers for data storage)
- Intercoupler and Auxiliary Keyboard WS/IC

*Multiple-cycle functions which depend upon operand values and decimal point position.