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|-----------|------------------|-----|-------------|-----|------------------|-----|------------------|-----|----------------------------------|----|-----|----|------------|----|----|----|----|----|
| IOCS | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Read | PIN | Rr_ | Rw | Dr_ | Dw | Lr_ | Lw | Ur_ | Uw | | | | | | | | | |
| Write | PIN state | | | | | | | | pin | | pin | | | | | | | |
| | SR | | | VCO | | DB | WD | | | | | | | | | | | |
| PIN state | 01=WEAK PULLDOWN | | 00=tristate | | 10=Vss(0) | | 11=Vdd(1) | | 9-bit DAC output level (155 xor) | | | | -Pin State | | | | | |
| WD | 0=NORMAL | | 1=inverted | | | | | | -Wake Direction | | | | | | | | | |
| DB | 1=OUTPUT | | 0=tristate | | | | | | -Data Bus direction | | | | | | | | | |
| SR | 0=RECEIVE | | 1=send | | | | | | -Serializer/Deserializer | | | | | | | | | |
| VCO | 10=OFF | | 00=input | | 01=Vdd calibrate | | 11=Vss calibrate | | -Voltage Controlled Oscillator | | | | | | | | | |

| Port | Address | Description |
|------|---------|---------------------------|
| -d-u | 105 | Down, Up |
| -d-- | 115 | Down |
| -d1u | 125 | Down, Left, Up |
| -d1- | 135 | Down, Left |
| data | 141 | Up, no handshake |
| ---u | 145 | Up |
| iocs | 15d | 18-bit I/O Control/Status |
| --1u | 165 | Left, Up |
| --1- | 175 | Left |

| Port | Address | Description |
|------|---------|-----------------------|
| rd-u | 185 | Right, Down, Up |
| rd-- | 195 | Right, Down |
| rd1u | 1a5 | Right, Down, Left, Up |
| rd1- | 1b5 | Right, Down, Left |
| r--u | 1c5 | Right, Up |
| r--- | 1d5 | Right |
| r-1u | 1e5 | Right, Left, Up |
| r-1- | 1f5 | Right, Left |

Note: ALWAYS refer to ports by name, addresses may change.

| | |
|---------|---|
| Address | 18-bit external address bus |
| Data | 18-bit external data bus |
| A | 18-bit general, address, 7-bit auto-increment |
| B | 9-bit general, address (write only) |

| | |
|------|---|
| P | 10-bit program register, 7-bit auto-increment |
| R | 18-bit 1+8 return stack |
| T, S | 18-bit 2+8 data stack |
| IOCS | 18-bit I/O Control and Status Register |

| Opcode | Hex | Slot | Notes | -- ADDRESS opcodes |
|--------|-----|------|--------------------------|--------------------|
| ; | 00 | 0123 | return | |
| :: | 01 | 012 | swap P and R (coroutine) | cf ;' |
| -; | 02 | 012 | jump | cf ; |
| : | 03 | 012 | call | cf red |
| unext | 04 | 0123 | | |
| next | 05 | 012 | | |
| if | 06 | 012 | jump t=0 | |
| -if | 07 | 012 | jump t17=0 | |
| @p+ | 08 | 0123 | literal | |
| @a+ | 09 | 012 | | cf @+ |
| @b | 0a | 012 | | cf @ |
| @a | 0b | 012 | | cf @ |
| !p+ | 0c | 0123 | | |
| !a+ | 0d | 012 | | cf !+ |
| !b | 0e | 012 | | |
| !a | 0f | 012 | | cf ! |

| Opcode | Hex | Slot | Notes | -- ALU opcodes |
|--------|-----|------|--------------------|----------------|
| + | 10 | 0123 | . +* | |
| 2* | 11 | 012 | | |
| 2/ | 12 | 012 | signed | |
| not | 13 | 012 | invert (3ffff xor) | cf - |
| + | 14 | 0123 | . + | |
| and | 15 | 012 | | |
| xor | 16 | 012 | | cf or |
| drop | 17 | 012 | | |
| dup | 18 | 0123 | | |
| pop | 19 | 012 | | |
| over | 1a | 012 | | |
| a@ | 1b | 012 | register fetch | cf a |
| . | 1c | 0123 | nop | |
| push | 1d | 012 | | |
| b! | 1e | 012 | register store | |
| a! | 1f | 012 | register store | |