IDEX HT2425 + Tic T500 Controller

PC Command Reference

Connection Settings (USB to Arduino)

Parameter	Value
Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Line Ending	Newline (LF) or Carriage Return (CR)

Hardware Configuration

Device	Serial Port	Arduino Pins	Baud Rate
IDEX Valve 1	Serial1	TX1=18, RX1=19	19200
IDEX Valve 2	Serial2	TX2=16, RX2=17	19200
Tic T500 Stepper	Serial3	TX3=14, RX3=15	9600

Command Format

```
None
<device><command>[value]
```

Prefix	Device
1	IDEX Valve 1

`2`	IDEX Valve 2
`S`	Tic T500 Stepper Motor
`?`	Help

VALVE COMMANDS

Command Summary

Command	Description	Value Required
`P`	Move to position	Yes (1-24)
`M`	Home valve	No
`S`	Query status/position	No
`E`	Read error code	No

Move to Position (P)

Moves the specified valve to a position (1-24).

Format: `<valve>P<position>`

Example	Description
`1P1`	Move valve 1 to position 1
`1P5`	Move valve 1 to position 5
`1P24`	Move valve 1 to position 24
`2P1`	Move valve 2 to position 1
`2P12`	Move valve 2 to position 12

Response:

```
None
> 1P5
Moving valve 1 to position 5
OK: Move accepted
```

Home Valve (M)

Returns the valve to its home position.

Format: `<valve>M`

Example	Description
`1M`	Home valve 1
`2M`	Home valve 2

Query Status (S)

Returns the current valve position or error code.

Format: `<valve>S`

Example	Description
`1S`	Query valve 1 status
`2S`	Query valve 2 status

Response:

```
None
> 1S
```

```
Position: 5
```

Read Error Code (E)

Returns the last error code stored by the valve.

Format: `<valve>E`

Example	Description
`1E`	Read valve 1 error code
`2E`	Read valve 2 error code

Valve Error Codes

Hex Code	Description
0x00	No error
0x2C	Data CRC error
0x37	Data integrity error
0x42	Valve positioning error
0x4D	Config/command mode error
0x58	Non-volatile memory error
0x63	Valve failure (cannot home)

STEPPER MOTOR COMMANDS

Command Summary

Command	Description	Value Required
`SO`	Stepper ON (energize)	No
`SF`	Stepper OFF (de-energize)	No
`SS`	Stop (halt and hold)	No
`SV`	Set velocity	Yes (signed integer)
`SP`	Set target position	Yes (signed integer)
`SR`	Read status	No
`SC`	Set current position to 0	No
`SM`	Set max speed	Yes (unsigned integer)
`SA`	Set max acceleration	Yes (unsigned integer)

Stepper ON (SO)

Energizes the motor coils and exits safe start mode. Must be called before motor will move.

Format: `SO`

Response:

```
None
> SO
Energizing stepper...
OK: Motor energized
```

Stepper OFF (SF)

De-energizes the motor coils. Motor will coast to a stop and no longer hold position.

Format: `SF`

Response:

```
None
> SF
De-energizing stepper...
OK: Motor de-energized
```

Stop Motor (SS)

Immediately stops the motor (ignoring deceleration limits) and holds position.

Format: `SS`

Response:

```
None
> SS
Stopping stepper...
OK: Motor stopped
```

Set Velocity (SV)

Sets the target velocity. Motor will accelerate/decelerate to reach this velocity.

Format: `SV<velocity>`

Units: Pulses per 10,000 seconds

Direction: Positive = forward, Negative = reverse

Velocity Conversion Table

Command	Calculation	Speed

`SV100000`	100,000 ÷ 10,000	10 steps/sec
`SV500000`	500,000 ÷ 10,000	50 steps/sec
`SV1000000`	1,000,000 ÷ 10,000	100 steps/sec
`SV2000000`	2,000,000 ÷ 10,000	200 steps/sec
`SV5000000`	5,000,000 ÷ 10,000	500 steps/sec
`SV10000000`	10,000,000 ÷ 10,000	1000 steps/sec

Examples

Example	Description
`SV1000000`	Run forward at 100 steps/sec
`SV2000000`	Run forward at 200 steps/sec
`SV-1000000`	Run reverse at 100 steps/sec
`SV-500000`	Run reverse at 50 steps/sec
`SV0`	Decelerate to stop

Response:

```
None
> SV1000000
Setting velocity: 1000000 pulses/10000s
OK
```

Set Target Position (SP)

Sets the target position. Motor will move to this position and stop.

Format: `SP<position>`

Units: Microsteps (depends on step mode setting)

Example	Description
`SP0`	Move to position 0
`SP1000`	Move to position 1000
`SP-500`	Move to position -500
`SP10000`	Move to position 10000

Response:

```
None
> SP1000
Setting target position: 1000
OK
```

Read Status (SR)

Reads and displays the current stepper motor status.

Format: `SR`

Response:

```
None
> SR
Stepper Status:
  State: Normal
```

```
Current position: 1000
Current velocity: 0 pulses/10000s
Target position: 1000
```

Operation States

State	Description
Reset	Controller was reset
De-energized	Motor coils are off
Soft error	Error condition exists
Waiting for ERR line	Waiting for error line
Starting up	Initializing
Normal	Operating normally

Set Current Position to Zero (SC)

Stops the motor and sets the current position value to 0. Useful for establishing a home reference.

Format: `SC`

Response:

```
None
> SC
Setting current position to: 0
OK
```

Set Max Speed (SM)

Sets the maximum allowed speed for the motor.

Format: `SM<speed>`

Units: Pulses per 10,000 seconds

Example	Description
`SM1000000`	Max speed 100 steps/sec
`SM5000000`	Max speed 500 steps/sec
`SM10000000`	Max speed 1000 steps/sec

Set Max Acceleration (SA)

Sets the maximum acceleration and deceleration rate.

Format: `SA<acceleration>`

Units: Pulses per 100 seconds²

Example	Description
`SA10000`	Set acceleration rate
`SA50000`	Set higher acceleration

QUICK REFERENCE CARD

None

```
================================================================
                        VALVE COMMANDS
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```

```
  1P<1-24>    Move valve 1 to position      2P<1-24>    Valve 2
  1S          Query valve 1 status          2S          Valve 2
  1M          Home valve 1                  2M          Valve 2
  1E          Read valve 1 error            2E          Valve 2

═══════════════════════════════════════════════════════════════
                    STEPPER COMMANDS
═══════════════════════════════════════════════════════════════
  SO          Stepper ON (energize)
  SF          Stepper OFF (de-energize)
  SS          Stop (halt and hold)

  SV<n>       Set velocity (pulses/10000s)
              Positive = forward, Negative = reverse
              Example: SV1000000 = 100 steps/sec forward
              Example: SV-500000 = 50 steps/sec reverse

  SP<n>       Set target position (microsteps)
  SR          Read stepper status
  SC          Set current position to 0
  SM<n>       Set max speed
  SA<n>       Set max acceleration

  ?           Show help
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```

USAGE EXAMPLES

Example 1: Basic Valve Operation

```
None
1S          Query valve 1 current position
1M          Home valve 1
```

```
1P5         Move valve 1 to position 5
1S          Verify position
2P12        Move valve 2 to position 12
```

Example 2: Run Stepper at Constant Speed

```
None
SO          Turn stepper on (energize)
SR          Check status
SV1000000   Run forward at 100 steps/sec
            (motor runs continuously)
SV0         Decelerate to stop
SF          Turn stepper off
```

Example 3: Run Stepper in Reverse

```
None
SO          Turn stepper on
SV-2000000  Run reverse at 200 steps/sec
SV0         Decelerate to stop
```

Example 4: Move Stepper to Position

```
None
SO          Turn stepper on
SC          Set current position as 0 (home)
SP1000      Move to position 1000
SR          Check if arrived
SP0         Return to home position
```

Example 5: Emergency Stop

```
None
SS          Immediately stop and hold position
```

Example 6: Complete System Sequence

```
None
SO          Enable stepper
1M          Home valve 1
2M          Home valve 2
1P3         Valve 1 to position 3
SV500000    Run stepper at 50 steps/sec
            (wait for desired time)
SV0         Stop stepper
1P5         Valve 1 to position 5
2P8         Valve 2 to position 8
SF          De-energize stepper
```

TROUBLESHOOTING

Valve Issues

Symptom	Possible Cause	Solution
No response	Wiring incorrect	Check TX→RXD, RX→TXD, GND
No response	No power	Verify 24VDC to valve
Error 0x42	Position error	Home valve and retry
Error 0x63	Home failure	Check for obstruction

Stepper Issues

Symptom	Possible Cause	Solution
No response	Wiring incorrect	Check TX→RX, RX→TX, GND
Motor won't move	Not energized	Send `S0` command
Motor won't move	Safe start active	Send `S0` (includes exit safe start)
Motor won't move	Wrong control mode	Use Tic Control Center to set "Serial/I²C/USB" mode
Motor stutters	Speed too high	Reduce velocity or increase acceleration
Wrong direction	Wiring reversed	Swap motor coil wires or use negative velocity

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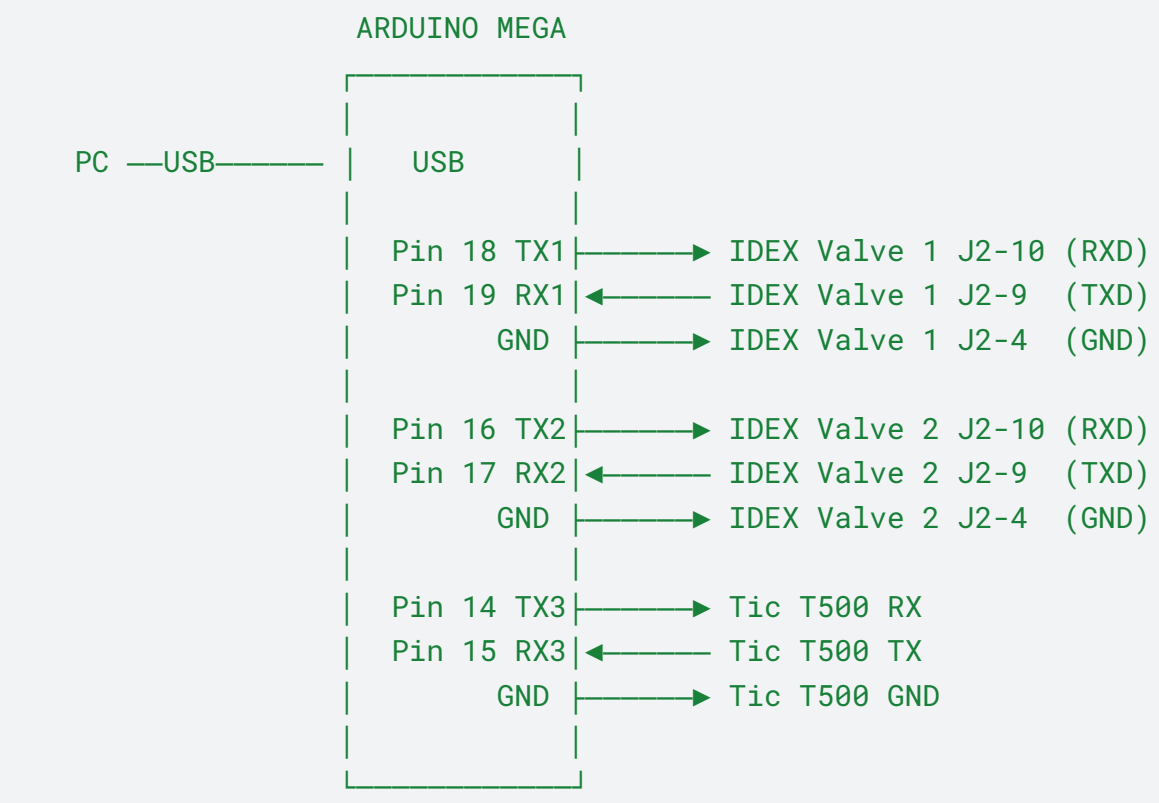
WIRING DIAGRAM

None



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Supported Hardware:

- IDEX HT2425 (TitanHT 24-Position/25-Port Valve)
- Pololu Tic T500 Stepper Motor Controller
- Arduino Mega 2560