OnStepX Network Connection Setup Guide

🌐 What Changed

Your telescope driver now supports **BOTH** connection types:

- ✅ **Network (WiFi/Ethernet)** - YOUR CURRENT SETUP
- ✅ **USB Serial** - For future USB connections

You can easily switch between them with one config change!

🚀 Quick Setup (Network Connection)

Step 1: Find Your OnStepX IP Address

Option A: Check OnStepX Display/Web Interface

- Most OnStepX controllers show IP on their display
- Or check your router's DHCP client list

Option B: Scan Your Network

```bash
cd ~/Downloads/alpaca-onstepx/
source venv/bin/activate
python test_telescope_connection.py scan 192.168.1
```

This will find all OnStepX devices on your network!

Step 2: Update config.py

Open `config.py` and update:

```python
TELESCOPE_CONFIG = {
    'connection_type': 'network',  # ← Already set correctly

    'network': {
        'host': '192.168.1.100',  # ← CHANGE TO YOUR ONSTEPX IP
        'port': 9999,             # ← Standard port (don't change)
    },

    # ... (serial settings below - ignore for now)
}
```

Step 3: Test the Connection

```bash
cd ~/Downloads/alpaca-onstepx/
source venv/bin/activate

# Test your specific IP
python test_telescope_connection.py network 192.168.1.100
```

Expected Output:

```
============================================================
Testing NETWORK Connection
============================================================
Host: 192.168.1.100
Port: 9999

Attempting connection...

✓ CONNECTION SUCCESSFUL!

Testing basic commands:
----------------------------------------
Product:    OnStep
Firmware:   4.21e
RA:         10.5432 hours
Dec:        45.1234 degrees
Tracking:   ON
Latitude:   40.7128 degrees
Longitude:  -74.0060 degrees

✓ All tests passed!
✓ Disconnected cleanly
```

Step 4: Run the Full Server

```bash
python main.py
```

You should see:

```
Initializing devices...
  Telescope configured for NETWORK connection to 192.168.1.100:9999
✓ Telescope initialized (call connect() to establish connection)
```

🔧 Troubleshooting Network Connection

"Connection refused"

Check 1: Is OnStepX powered on and WiFi enabled?

Check 2: Ping the OnStepX

```bash
ping 192.168.1.100
```

Check 3: Try the web interface

```
http://192.168.1.100
```

If you can access the web interface, the IP is correct!

Check 4: Verify port 9999 is open

```bash
nc -zv 192.168.1.100 9999
```

"Connection timeout"

- **Wrong IP address** - Use the scan tool to find it
- **Different subnet** - OnStepX might be on 192.168.0.x instead of 192.168.1.x
- **WiFi not enabled** on OnStepX

"No response from OnStepX"

- **Wrong port** - Should be 9999 (standard)
- **Firewall blocking** - Check Pi firewall:

```bash
 sudo ufw allow out 9999/tcp
```

🔄 Switching to USB (Future Use)

If you ever want to use USB instead of WiFi:

Step 1: Update config.py

```python
TELESCOPE_CONFIG = {
    'connection_type': 'serial',  # ← Change to 'serial'

    # ... (network settings above - ignore)

    'serial': {
        'port': '/dev/ttyUSB0',    # ← USB port
        'baudrate': 9600,
        'timeout': 2,
        'auto_detect_port': True
    }
}
```

Step 2: Test Serial Connection

```bash
python test_telescope_connection.py serial /dev/ttyUSB0
```

Step 3: Check Permissions

If you get "Permission denied":

```bash
sudo usermod -a -G dialout $USER
# Log out and back in for this to take effect
```

📊 Connection Comparison

Feature	Network (WiFi)	USB Serial
Range	Anywhere on WiFi	Cable length only
Speed	Fast	Slower
Setup	Need IP address	Plug and play
Reliability	Depends on WiFi	Very reliable
Your Setup	✅ **Current**	Available

🎯 What to Test

Once the server is running:

1. **Test Connection in N.I.N.A.**
   - Equipment → Telescope → Choose ASCOM
   - Server should auto-discover via UDP
   - Click Connect
2. **Verify Position Reading**
   - Should show current RA/Dec
   - Updates every second
3. **Test Tracking**
   - Enable/disable tracking
   - Change tracking rate
4. **Test Slewing**
   - Slew to coordinates
   - Verify mount responds

🔐 Network Security Notes

Current Status: No authentication required

Recommendation: Use a private network or VPN if concerned about security

Future: Could add authentication layer if needed

📝 Common OnStepX Network Ports

- **9999** - Standard command port (LX200 protocol)
- **80** - Web interface
- **32227** - Alpaca discovery (your Pi, not OnStepX)

✅ Success Checklist

□ Found OnStepX IP address
□ Updated config.py with correct IP
□ Test script connects successfully
□ Server starts without errors
□ N.I.N.A. discovers and connects
□ Can read telescope position

🆘 Still Having Issues?

Run the diagnostic:

```bash
cd ~/Downloads/alpaca-onstepx/
source venv/bin/activate

# Full diagnostic
python test_telescope_connection.py scan
python test_telescope_connection.py network <your-ip>
```

Check the output and let me know what errors you see!

📚 Technical Details

Network Protocol

- **Type:** TCP/IP socket connection
- **Port:** 9999 (configurable)
- **Protocol:** LX200-compatible command set
- **Format:** ASCII text commands ending with `#`

Example Commands

```
:GR#  - Get Right Ascension
:GD#  - Get Declination
:MS#  - Slew to target
:Q#   - Stop slewing
```

Connection Flow

1. Create TCP socket
2. Connect to OnStepX IP:9999
3. Send `:GVP#` to verify connection
4. Commands/responses are ASCII text
5. All responses end with `#`

Your network setup is now complete! The telescope will connect via WiFi, and you can always switch to USB later by changing one config setting. 🎉