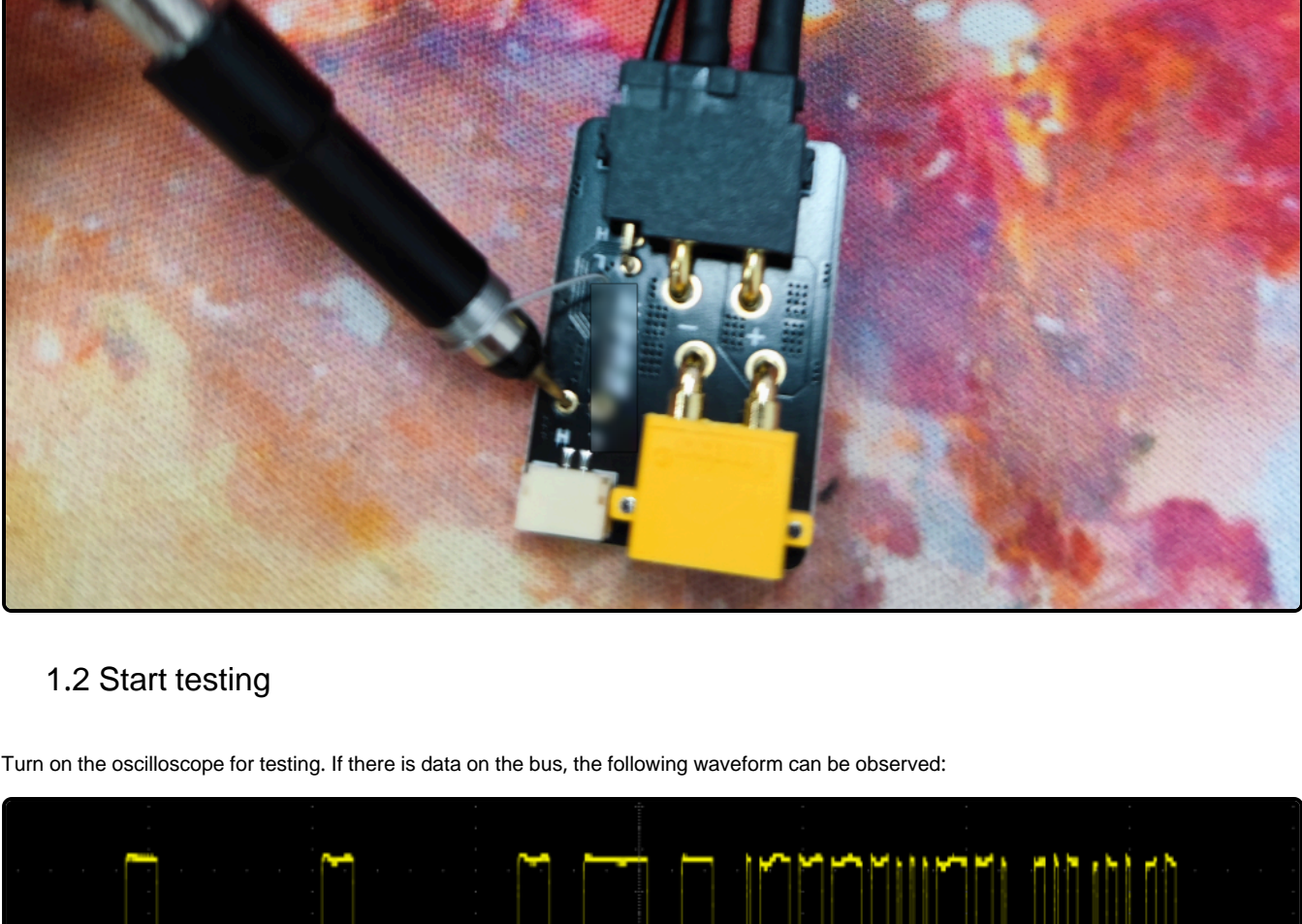


# CAN bus waveform measurement

## # 1. Test Preparation

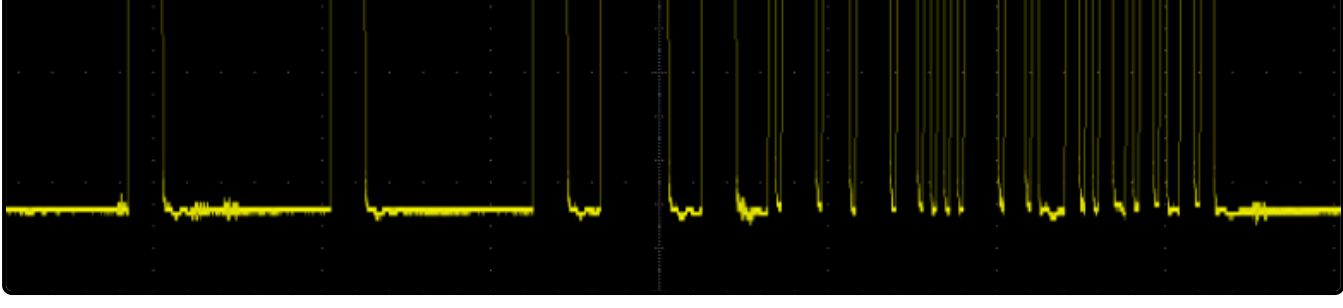
### 1.1 Preparation

- DM-MC02 (H723 development board) configures FDCAN with a 1M baud rate for the arbitration segment and a 5M baud rate for the data segment.
- Using dm\_ctl(h7 fdcan) v1.0 bare-metal example.
- Send 10 data frames every 1 ms, resulting in a frame frequency of 10,000 frames per second.
- Use a spring probe for testing; the probe connects to L, and the probe tip connects to H.



### 1.2 Start testing

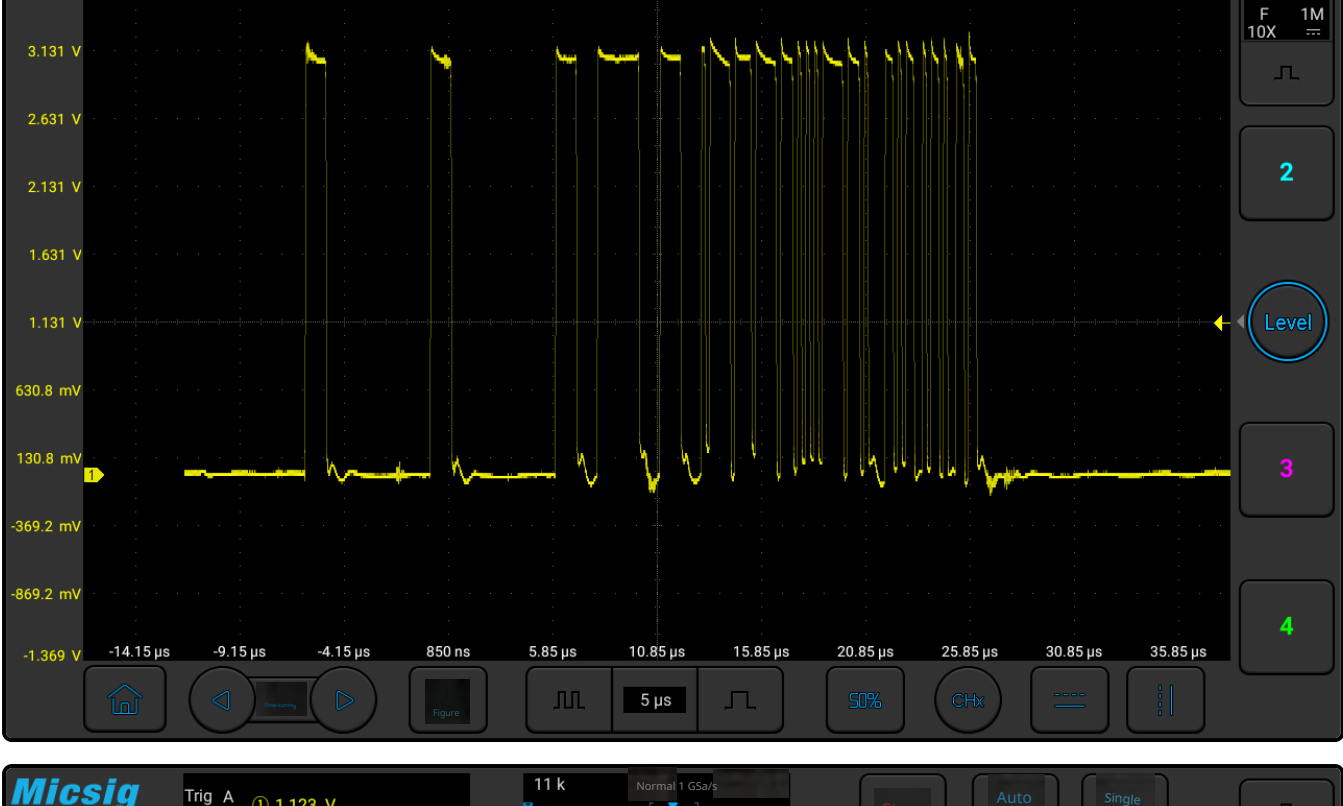
Turn on the oscilloscope for testing. If there is data on the bus, the following waveform can be observed:



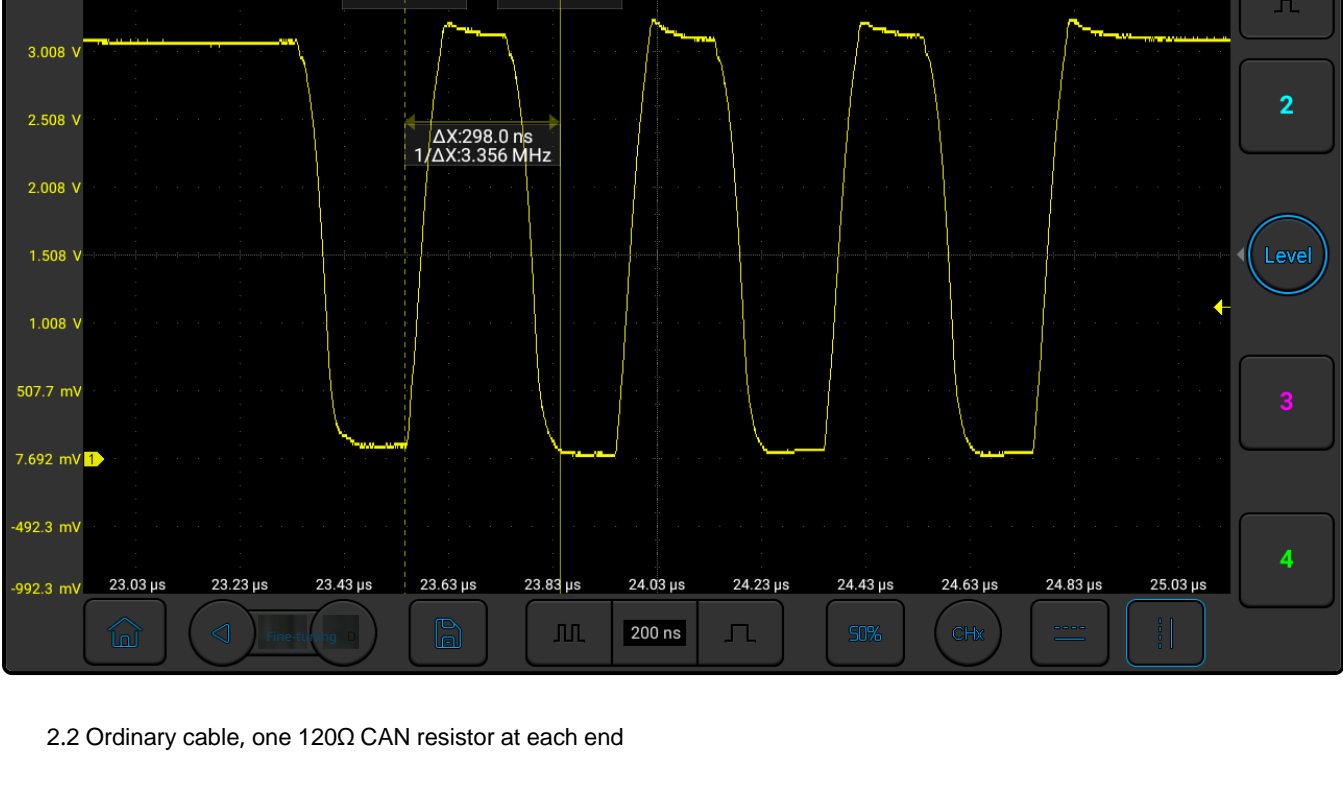
By observing this waveform, we can assess the data and interference present on the bus.

## # 2. CAN Bus Waveform Comparison Test

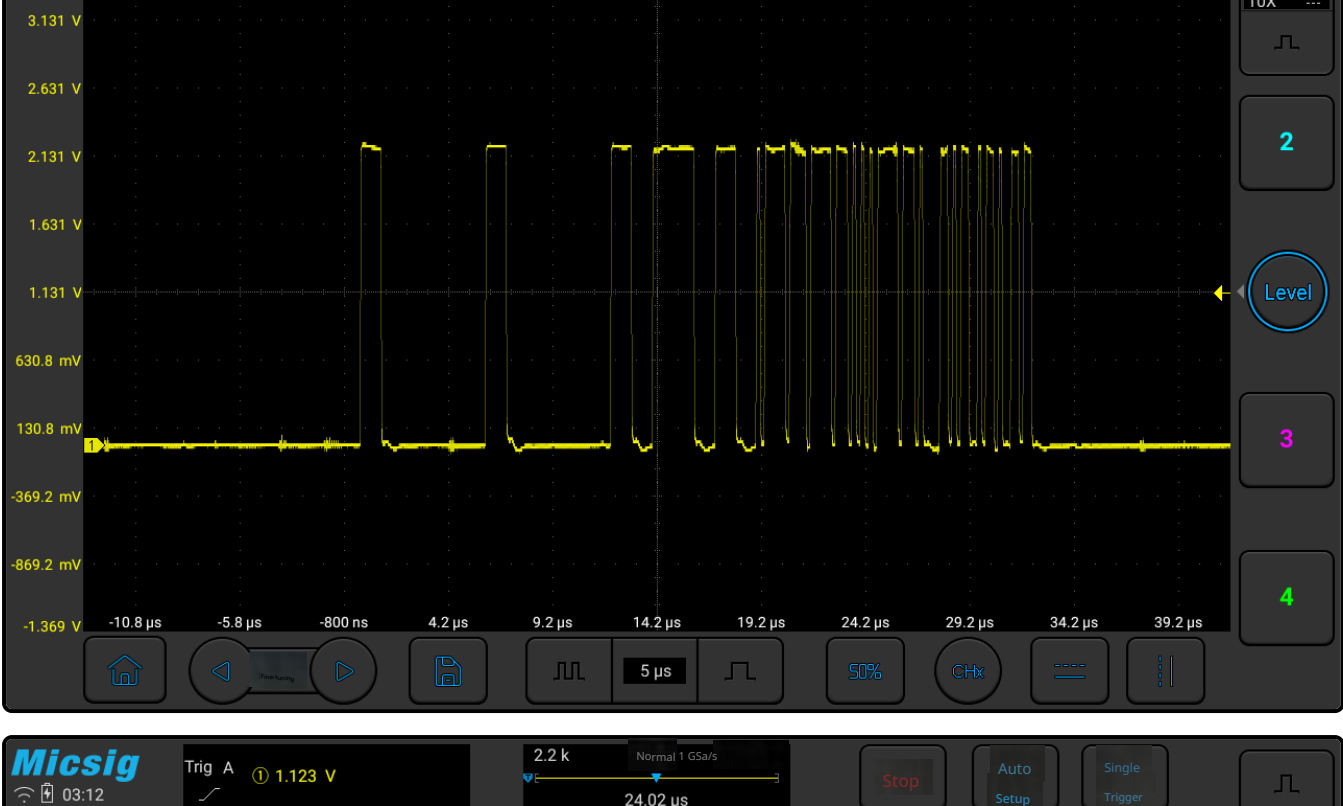
### 2.1 Ordinary cable, one 120Ω CAN resistor



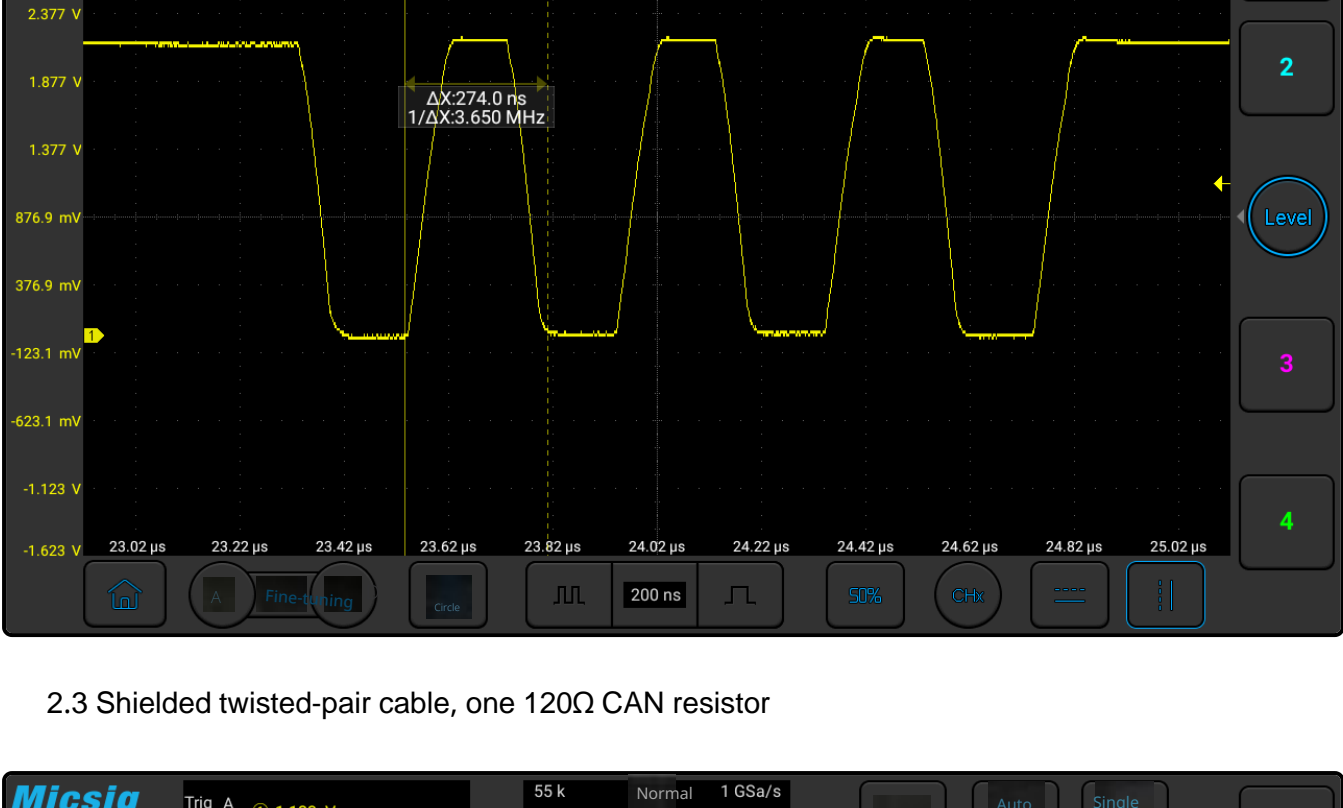
### 2.2 Ordinary cable, one 120Ω CAN resistor at each end



### 2.3 Shielded twisted-pair cable, one 120Ω CAN resistor



### 2.4 Shielded twisted-pair cable, one 120Ω CAN resistor at each end



### 2.5 Comparative Conclusion

As the waveform tests above were preliminary, they only suggest a method for problem identification and are not entirely conclusive. Readers are encouraged to consult additional resources.

The waveform tests above demonstrate that the presence of 120Ω termination resistors at both ends of the CAN bus significantly impacts signal quality. A single CAN resistor results in substantial waveform noise and oscillation, deviating significantly from a clean square wave.

Conversely, implementing 120Ω CAN resistors at both ends produces a regular square wave with noticeably reduced noise, indicating that CAN termination effectively improves communication quality.

Comparing the waveforms of ordinary CAN cables with those of twisted-pair shielded cables reveals a slight reduction in noise. Although the difference isn't readily apparent, twisted-pair shielded cables offer superior interference immunity compared to ordinary CAN cables.

## # 3. Recommendations

- Strictly adhere to the CAN bus standard by adding a 120Ω resistor at each end.
- Using twisted-pair shielded cables is recommended to enhance the bus's anti-interference capabilities.