# VI Logger

## IoT 환경에서  실시간 V, I, R 측정
AC 220V회로, Wi-Fi 데이터 전송

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김주호

# 목차

문제점 해결

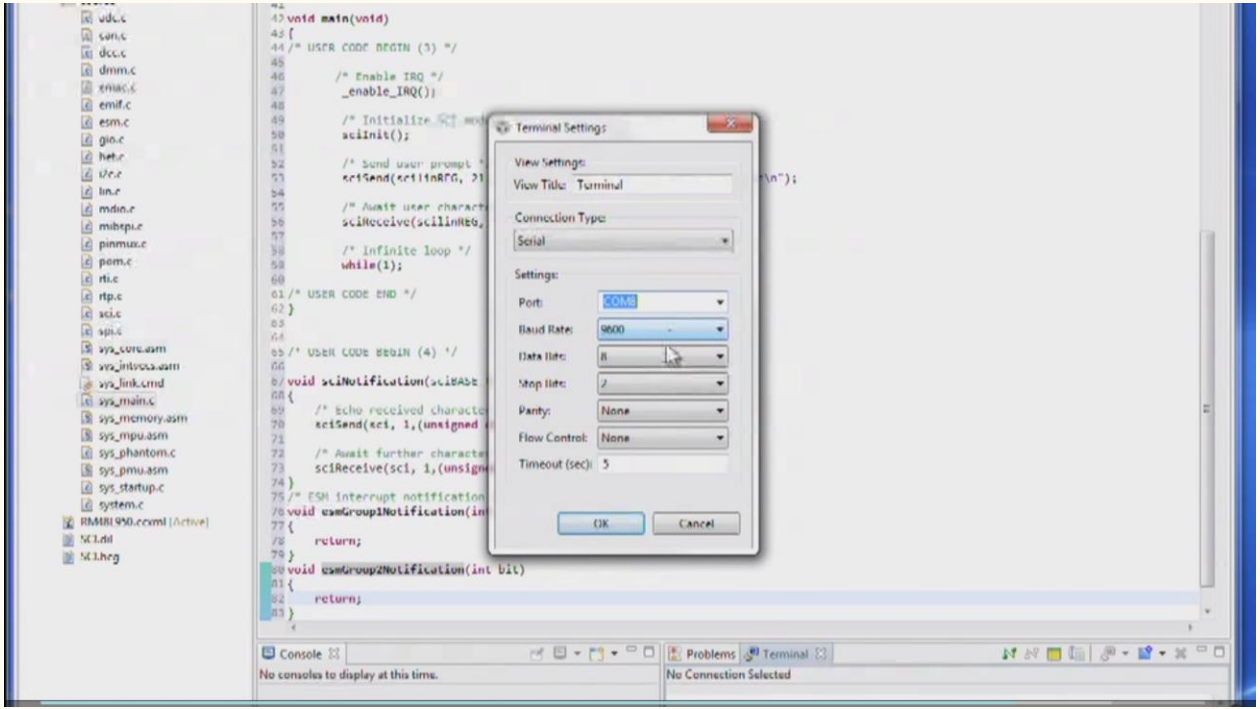
# 개발할 때 발견된 문제점들 2

## 문제점

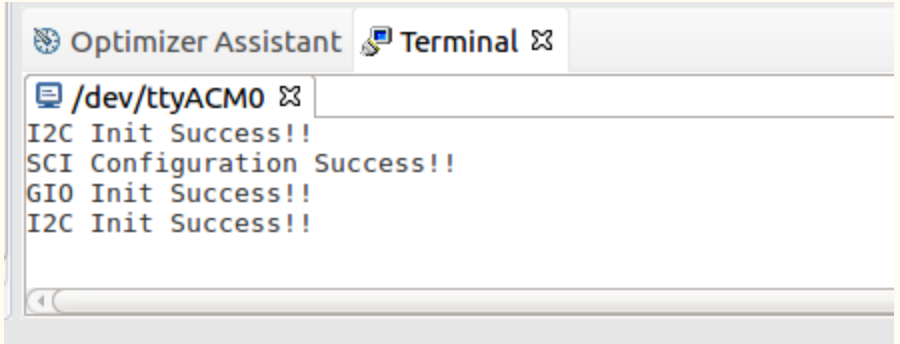
- MCU에선 C언어와 달리 printf 를 통해 센서에서 들어오는 값을 보는 것이 불가능함.
- SCI(Serial Communication Interface)통신에서 개발에 필요한 부분은 아직 배우지 않았음.

## 해결책

- SCI 통신을 구현하기에 앞서 센서에서 받는 값을 컴퓨터상에서 확인할 다른 방법 I2C(현재 단계 개인 실험용)
- 앞으로 이루어질 시스템프로그래밍 수업에서 구현에 필요한 부분을 가르쳐주실 예정(UART).




TI Code Composer Studio



# HET

The High-End Timer (HET) is a programmable timer co-processor available on TI's high-performance Hercules Microcontrollers. The HET enables sophisticated timing functions for real-time control applications. Programming the HET provides an alternate approach to the use of costly FPGAs or ASICs which can take up valuable board space and consume unnecessary power.

The High End Timer Integrated Development Environment (HET IDE) is a windows based application that provides an easy way to get started developing and debugging code for the HET.

The simulation kernel provides full visibility into program execution and also break point capability to stop execution on specific instructions. Waveformer Pro from SynaptiCAD provides a professional tool for waveform creation and visualization.

**For more information on how to get started with the HET IDE please refer to the wiki page.**

## What's Included

The HET IDE has 3 main components:

1. Graphical User Interface for ease of use
2. Simulation kernel
3. Integrated waveform viewer from SynaptiCAD

The HET IDE also comes with code examples to make it even easier to get started.

# 목차

# 목표

1. AC220V를 사용하는 환경에서의 V, I, R을 측정하여 무선(Wi-Fi)으로 정보를 컴퓨터로 송신.
2.컴퓨터로 송신되는 데이터를 데이터베이스화

# 부품

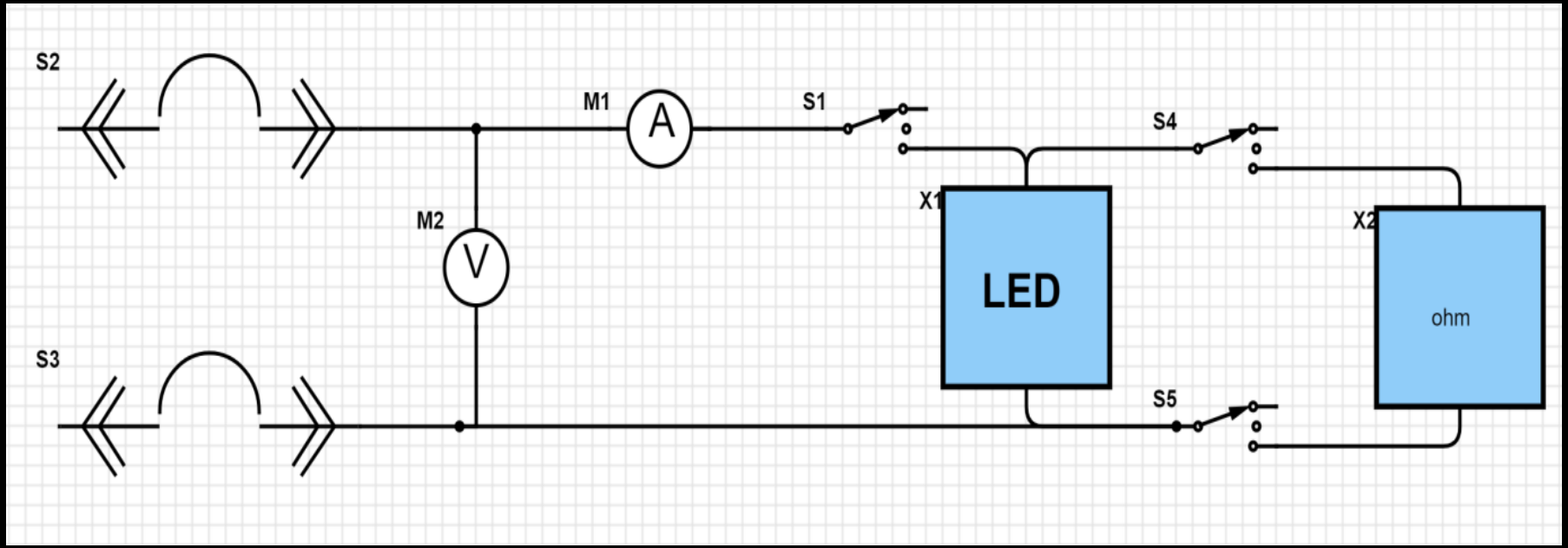
Found around the house!

- 누전차단기
- AC 전압센서
- AC 전류센서
- Relay
- AC 220V LED전구
- TI 570 Developer kit
- ESP8266 Wi-Fi 모듈

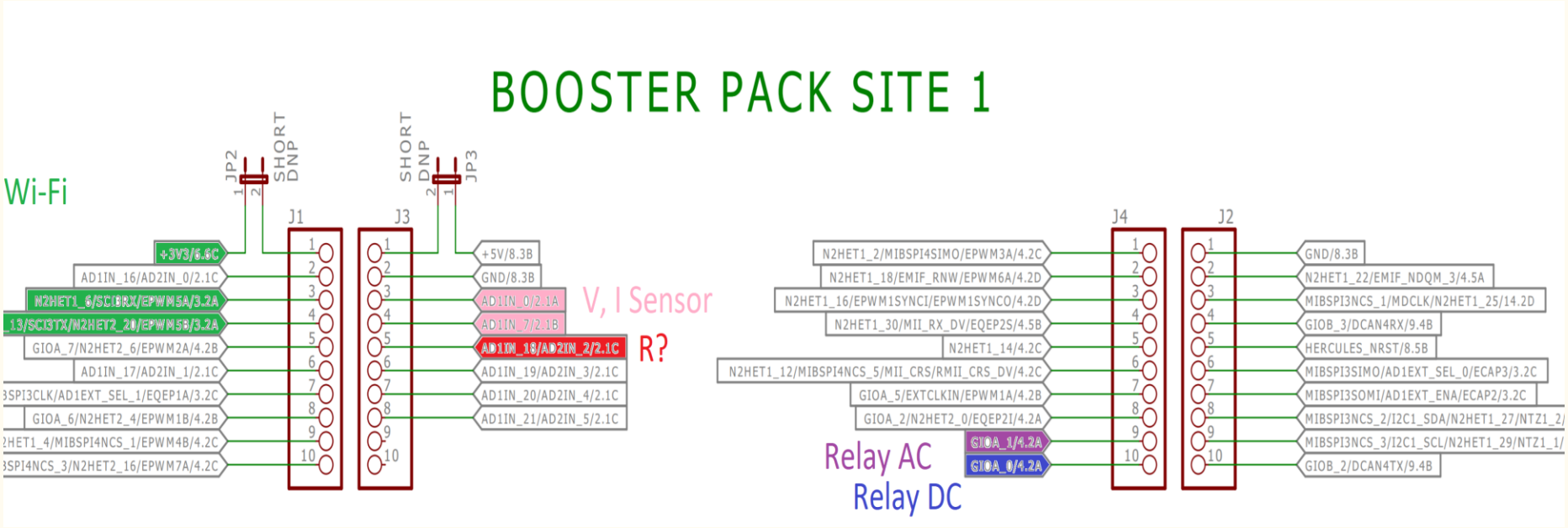
# BOM

| | 부품명 | 수량 | 가격 |
|---|---|---|---|
| 1 | 테스트[CH254]소켓 점퍼 케이블 40P (칼라) (F/F) | 1 | 1100 |
| 2 | 테스트[CH254]소켓 점퍼 케이블 40P (칼라) (M/M) | 1 | 1100 |
| 3 | ACS712 20A 전류 센서 모듈 [SZH-SSBH-094] | 1 | 3520 |
| 4 | 핀헤더소켓 SO127-50핀 (1.27mm) | 4 | 3212 |
| 5 | 핀헤더소켓 SO127-S2-20핀 (1.27mm) | 4 | 1628 |
| 7 | LC 기술 AC 전압 센서 모듈 ZMPT101B 250V 아두이노 | 1 | 4220 |
| 8 | SCT-013 비침습적 AC전류 센서 클램프 계기용변류기 | 1 | 8710 |
| 9 | 와이파이 모듈 ESP8266 아두이노 WIFI ESP-01 | 1 | 2360 |
| 10 | 누전차단기 15A | 1 | 8000 |
| 11 | 파워릴레이 JQC-3FF-5VDC-1ZS [SZH-EP058] | 6 | 3300 |
| 12 | 전구소켓 | 1 | 1200 |
| 13 | 220V LED 전구 | 1 | |
| 13 | 택배비 | 2 | 2500 |
| 14 | 전원플러그 220V | 1 | 1500 |
| 15 | TI LaunchPad | 1 | 43000 |
| 16 | PNP Transistor | 1 | |
| 현재까지 구매총액 | | | 85350 |

# 회로구성



# 핀 할당


BOOSTER PACK SITE 1
Wi-Fi
JP2
SHORT
DNP
JP3
J1
J3
J4
J2
+3V3/6.6C
AD1IN_16/AD2IN_0/2.1C
N2HET1_6/SCIRX/EPWM5A/3.2A
13/SCITX/N2HET2_20/EPWM5B/3.2A
GIOA_7/N2HET2_6/EPWM2A/4.2B
AD1IN_17/AD2IN_1/2.1C
SPI3CLK/AD1EXT_SEL_1/EQEP1A/3.2C
GIOA_6/N2HET2_4/EPWM1B/4.2B
HET1_4/MIBSPI4NCS_1/EPWM4B/4.2C
SPI4NCS_3/N2HET2_16/EPWM7A/4.2C
+5V/8.3B
GND/8.3B
AD1IN_0/2.1A
AD1IN_7/2.1B
AD1IN_18/AD2IN_2/2.1C
AD1IN_19/AD2IN_3/2.1C
AD1IN_20/AD2IN_4/2.1C
AD1IN_21/AD2IN_5/2.1C
V, I Sensor
R?
N2HET1_2/MIBSPI4SIMO/EPWM3A/4.2C
N2HET1_18/EMIF_RNW/EPWM6A/4.2D
N2HET1_16/EPWM1SYNCI/EPWM1SYNCO/4.2D
N2HET1_30/MII_RX_DV/EQEP2S/4.5B
N2HET1_14/4.2C
N2HET1_12/MIBSPI4NCS_5/MII_CRS/RMII_CRS_DV/4.2C
GIOA_5/EXTCLKIN/EPWM1A/4.2B
GIOA_2/N2HET2_0/EQEP2I/4.2A
GIOA_1/4.2A
GIOA_0/4.2A
Relay AC
Relay DC
GND/8.3B
N2HET1_22/EMIF_NDQM_3/4.5A
MIBSPI3NCS_1/MDCLK/N2HET1_25/14.2D
GIOB_3/DCAN4RX/9.4B
HERCULES_NRST/8.5B
MIBSPI3SIMO/AD1EXT_SEL_0/ECAP3/3.2C
MIBSPI3SOMI/AD1EXT_ENA/ECAP2/3.2C
MIBSPI3NCS_2/I2C1_SDA/N2HET1_27/NTZ1_2/
MIBSPI3NCS_3/I2C1_SCL/N2HET1_29/NTZ1_1/
GIOB_2/DCAN4TX/9.4B

# 소프트웨어 (가)설계

1. 센서-ADC
2. 실시간-HET
3. 통신-SCI(UART)
4. 데이터베이스

# 개발할 때 발견된 문제점들 1

**Microcontroller is too fast!**

Delay(10000); //LED 동작 안 보임

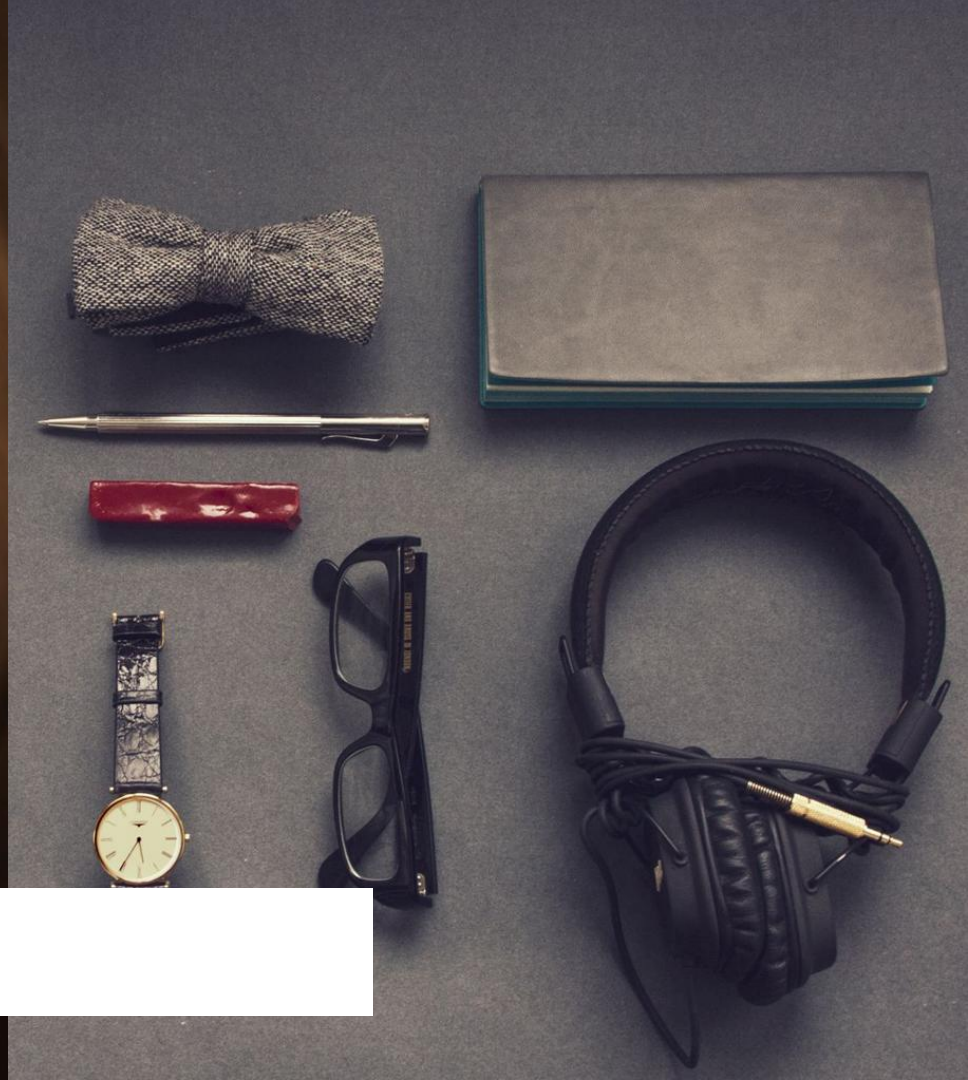
Delay(33333333); //LED 동작 보임

**센서**

Non invasive(비침습적) AC Current sensor 신뢰성 의심

**해결책**

- 정확한 시간(PWM)으로 릴레이 동작제어를 위해 GIO에서 HET 포트로 변경(Pin assignment 변경, 20s, Duty 50%)
- Relay 1개당 0.1A 사용: PNP TR설치
- Invasive AC Current Sensor 로 교체



The experiment

# Conclusion

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