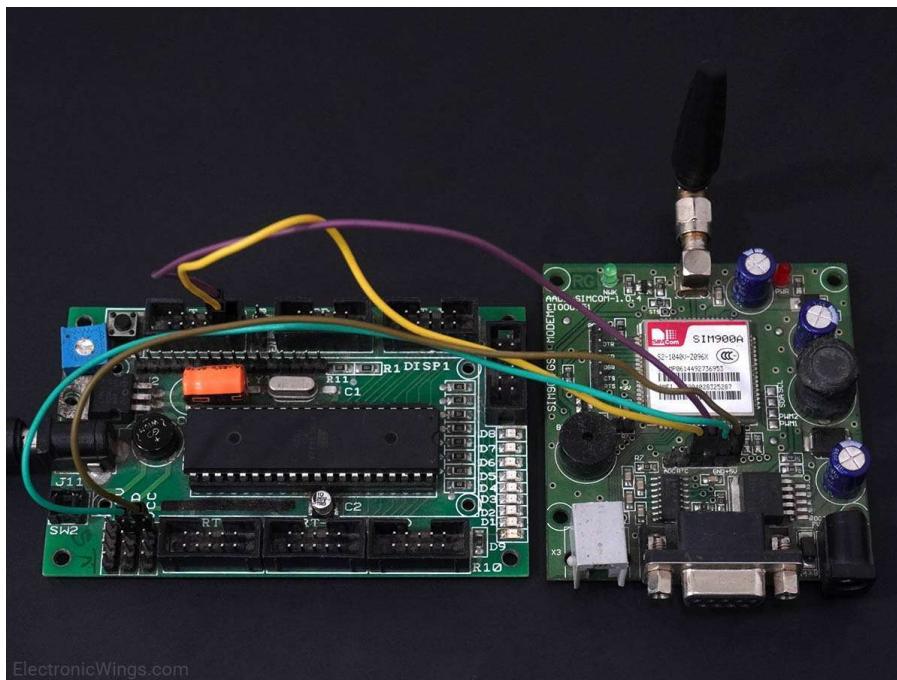


HTTP Client using SIM900A GPRS and AVR ATmega16



Overview of HTTP





SIM900

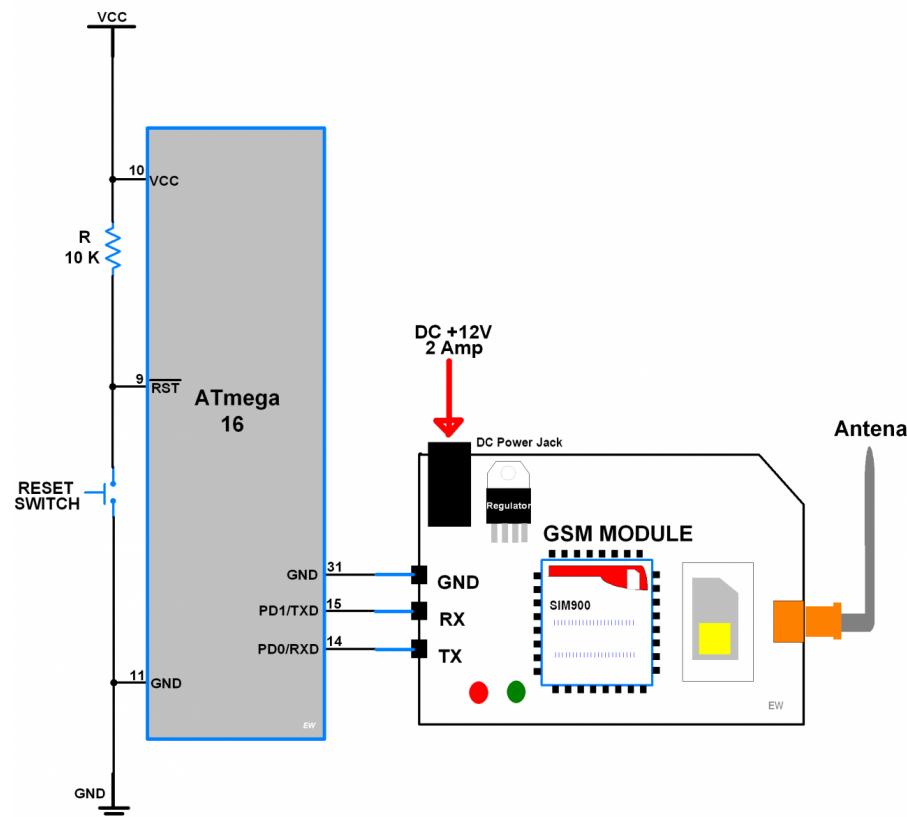
SIM900 enables GPRS to embedded applications. We can implement **HTTP** (https://en.wikipedia.org/wiki/Hypertext_Transfer_Protocol) Client protocol using the SIM900 HTTP function AT Commands.

The Hypertext Transfer Protocol (HTTP) is a standard application layer protocol that functions as a request-response protocol between server and client.

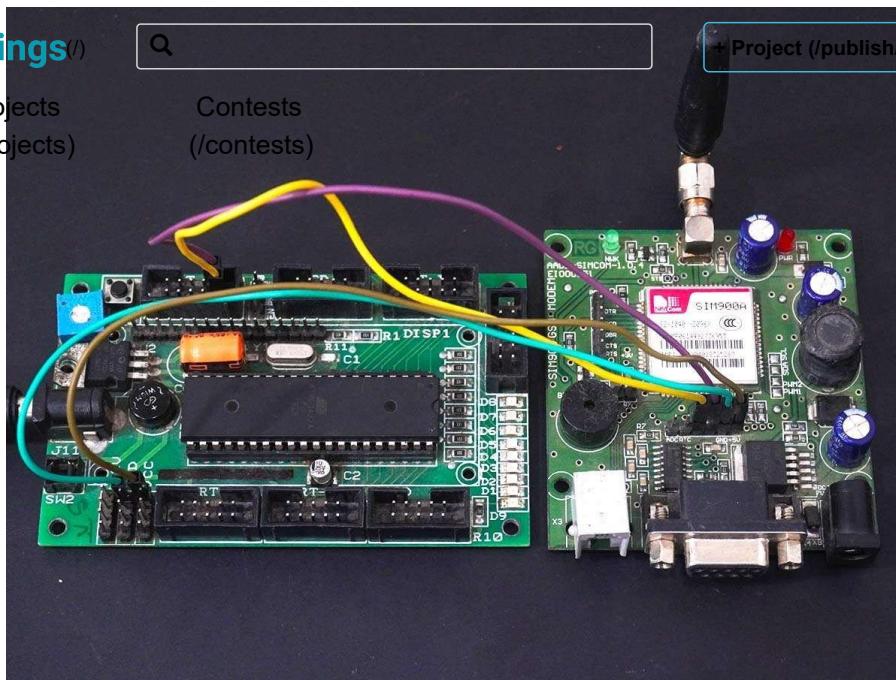
It is widely used in IoT (Internet of Things) embedded applications, where every sensor is connected to a server and we have access to control them over the internet.

To know about SIM900 GSM/GPRS Module refer to **SIM900** (<http://electronicwings.com/sensors-modules/sim900a-gsmgprs-module>)

Connection Diagram of SIM900 with ATmega16/32



Atmega16 interface with SIM900



HTTP Client over GPRS

Let's program AVR ATmega16 to configure SIM900A as HTTP Client and GET/POST data from/to Server using GPRS.

Here, we are using the Thingspeak server for HTTP Client demo purposes.

Thingspeak is an open IOT platform where anyone can visualize and analyze live data from their sensor devices. Also, we can perform data analysis on data posted by remote devices with Matlab code in Thingspeak. To learn more about Thingspeak refer link [\(https://thingspeak.com/pages/learn_more\)](https://thingspeak.com/pages/learn_more)

Just sign up and create a channel. We have below the channel and write key on Thingspeak for data send and receive.

- channel ID is = 119922
- Write Key is = C7JFHZY54GLCJY38

Note: Do not forget to tick the **Make Public** field in the **channel setting** option on your Thingspeak channel. It makes channels available to use as public. This allows any user to access channel data without any username & password.

For **HTTP GET** method, use below AT command steps shown in the screenshot of the RealTerm Serial Terminal.

The below screenshot consists of AT commands (Green) and Responses (Yellow).



Platforms
(/explore)

```
RealTerm: Serial Capture Program 2.0.0.70
Project (/public/project)

OK\r\n
AT+CPBR=3,1,"Contype","GPRS"\r\n
OK\r\n
AT+SAPBR=3,1,"APN","internet"\r\n
OK\r\n
AT+SAPBR=1,1\r\n
OK\r\n
AT+SAPBR=2,1\r\n
+SAPBR: 1,1,"10.74.112.68"\r\n
OK\r\n
AT+HTTPINIT\r\n
OK\r\n
AT+HTTPPARA = "CID",1\r\n
OK\r\n
AT+HTTPPARA="URL","api.thingspeak.com/channels/119922/feeds/last.txt"\r\n
OK\r\n
AT+HTTPACTION=0\r\n
OK\r\n
+HTTPACTION:0,200,67\r\n
AT+HTTPREAD\r\n
+HTTPREAD:67\r\n
{"created_at": "2017-04-29T10:31:32Z", "entry_id": 1074, "field1": "55"}\r\n
OK\r\n
```

For the HTTP POST method, use below AT command steps shown in the screenshot of the RealTerm Serial Terminal.

```
RealTerm: Serial Capture Program 2.0.0.70
AT+CPBR=3,1,"Contype","GPRS"\r\n
OK\r\n
AT+SAPBR=3,1,"APN","internet"\r\n
OK\r\n
AT+SAPBR=1,1\r\n
OK\r\n
AT+SAPBR=2,1\r\n
+SAPBR: 1,1,"10.109.195.233"\r\n
OK\r\n
AT+HTTPINIT\r\n
OK\r\n
AT+HTTPPARA = "CID",1\r\n
OK\r\n
AT+HTTPPARA="URL","api.thingspeak.com/update"\r\n
OK\r\n
AT+HTTPDATA=33,10000\r\n
DOWNLOAD\r\n
api_key=C7JFHZY54GLCJY38&field1=1\r\n
OK\r\n
AT+HTTPACTION=1\r\n
OK\r\n
+HTTPACTION:1,200,4\r\n
```

In the below program of HTTP Client, do the following

For HTTP Client GET method

```
#define GET_DEMO          /* Define GET demo */
#define POST_DEMO           /* Define POST demo */
```

For HTTP Client POST method

```
##define GET_DEMO          /* Define GET demo */
#define POST_DEMO           /* Define POST demo */
```

Edit Fields below with respective data



Platforms
[\(/explore\)](#)

Projects
[\(/projects\)](#)

Required fields shown below */

[+ Project \(/publish/project\)](#)



#define URL	"api.thingspeak.com/update"
#define API_WRITE_KEY	"your write key"
#define CHANNEL_ID	"your channel ID"
#define APN	"APN of your service provider"
#define USERNAME	"Username if any or left blank"
#define PASSWORD	"Password or left blank"

In the below program, we are using response-based functions to get a better status if things deviate from normal.

Program for HTTP Client with Thingspeak

```

/*
 * ATmega16_GPRS_HTTPClient
 * http://www.electronicwings.com
 *
 */

#define F_CPU 8000000UL      /* Define CPU clock Frequency e.g. here */
#include <avr/io.h>          /* Include AVR std. library file */
#include <string.h>          /* Include string library */
#include <stdio.h>           /* Include standard IO library */
#include <stdlib.h>           /* Include standard library */
#include <stdbool.h>          /* Include standard boolean library */
#include <util/delay.h>        /* Include delay header file */
#include <avr/interrupt.h>      /* Include avr interrupt header file */
#include "USART_RS232_H_file.h" /* Include USART header file */

#define SREG _SFR_IO8(0x3F)

#define DEFAULT_BUFFER_SIZE    200 /* Define default buffer size */
#define DEFAULT_TIMEOUT        20000 /* Define default timeout */
#define DEFAULT_CPLF_COUNT     2   /* Define default CPLF count */

```

SIM900 Response

At the client end, we need to check SIM900 responses. We can check it on the serial terminal of the PC/Laptop. Connect SIM900 transmit pin (TX) to the receive pin (RX) of Atmega16 Microcontroller and to the receive pin (RX) of USB to serial converter as shown in the below figure. connect USB to serial converter to PC/Laptop. Open the serial terminal on the PC/Laptop to see the SIM900 responses for the AT command sent from the Atmega16 microcontroller.



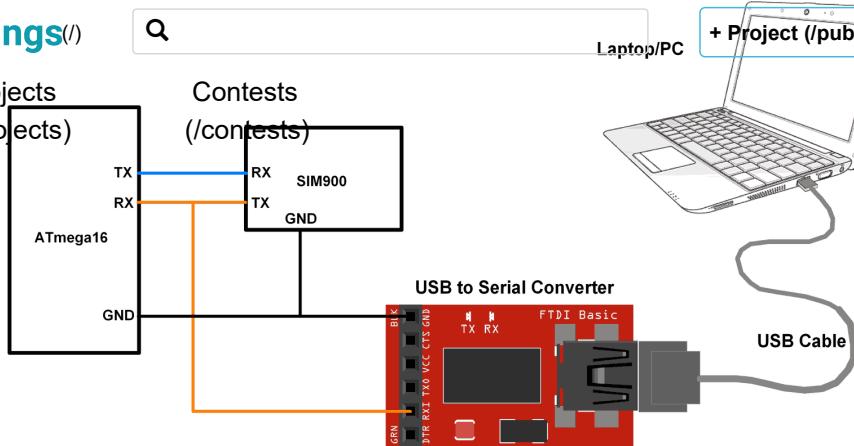
Platforms
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Laptop/PC

+ Project (/publish/project)



ATmega16 Interface with SIM900 GSM along with PC

Now for **HTTP POST** commands (sent from ATmega16 Microcontroller), we can see the below response from SIM900 on the serial terminal for the Thingspeak server.

```
+SAPBR: 1,1,"10.75.0.112"
OK
OK
DOWNLOAD
OK
OK
+HTTPACTION:1,200,3
+HTTPREAD:3
974
OK
+HTTPACTION:1,200,3
+HTTPREAD:3
975
OK
```

Thingspeak responds with entry id for success HTTP POST

In response to **HTTP POST**, we get the data entry no. as shown in the above figure i.e. 974, 975, and so on.

For **HTTP GET** commands (sent from ATmega16 Microcontroller), we can see the below response from SIM900 on the serial terminal for the Thingspeak server.



Platforms
(/explore)

```
+SAPBR: 1,1,"10.108.180.126"
OK
Project
(/proc
OK
Thingspeak response with last updated data
for HTTP GET
OK
+HTTPACTION:0,200,65
+HTTPREAD:65
{"created_at":"2017-04-29T07:08:47Z","entry_id":975,"field1":"2"}
OK
OK
OK
OK
+HTTPACTION:0,200,65
+HTTPREAD:65
{"created_at":"2017-04-29T07:08:47Z","entry_id":975,"field1":"2"}
OK
```

In response to **HTTP GET**, we get the last entry data for field1 on Thingspeak as shown in the above figure.

Note: here we are retrieving the last entry data on field1 of the Thingspeak server hence we get the last updated data of field1 from the server as shown in the above figure i.e. "field1":"2". In the program, we used "api.thingspeak.com/channels/119922/feeds/last.txt" to receive the last updated data only.

Updates at Thingspeak server on HTTP POST

For **HTTP POST**, we can see the output at the server end. Here we are using the Thingspeak server and sending the incremented count at field1 on the server. We get incremented count at field1 of Thingspeak server as shown in the below figure.



HTTP Client with Adafruit dashboard

In the IOT platform, Adafruit IO Dashboard allows us to visualize and control the connected device to the internet. Anyone can visualize and analyze live data from their sensor devices. To learn more and start with Adafruit IO Dashboard refer link



Platforms
[\(/explore\)](#)

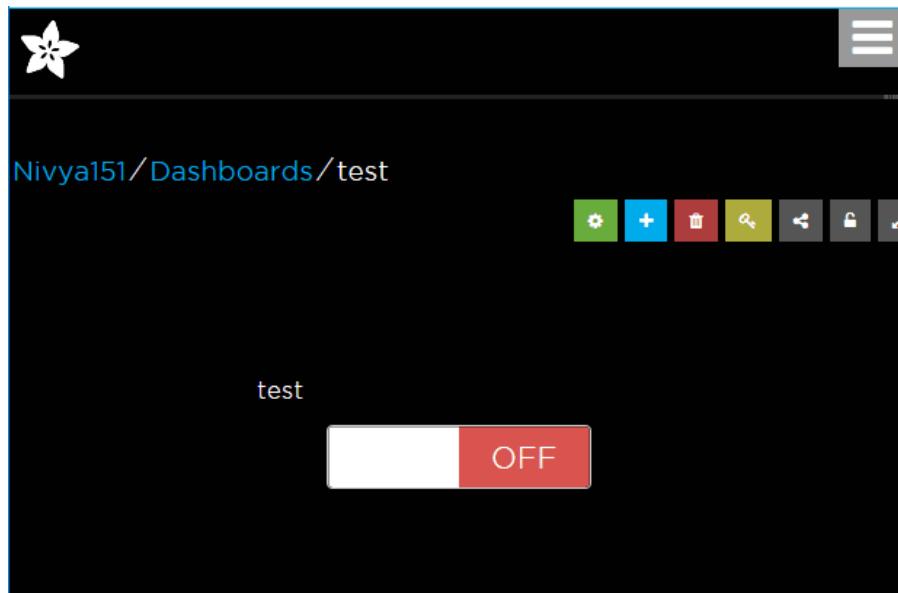
Projects
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 Just sign up and [create](#) a dashboard. After the successful creating of a dashboard, [\(/projects\)](#) get the AIQ ([key results](#)) is later used to access feed data.

Example

Now let's program AVR-based ATmega16 to control LED and monitor the status of Switch from the Adafruit dashboard.

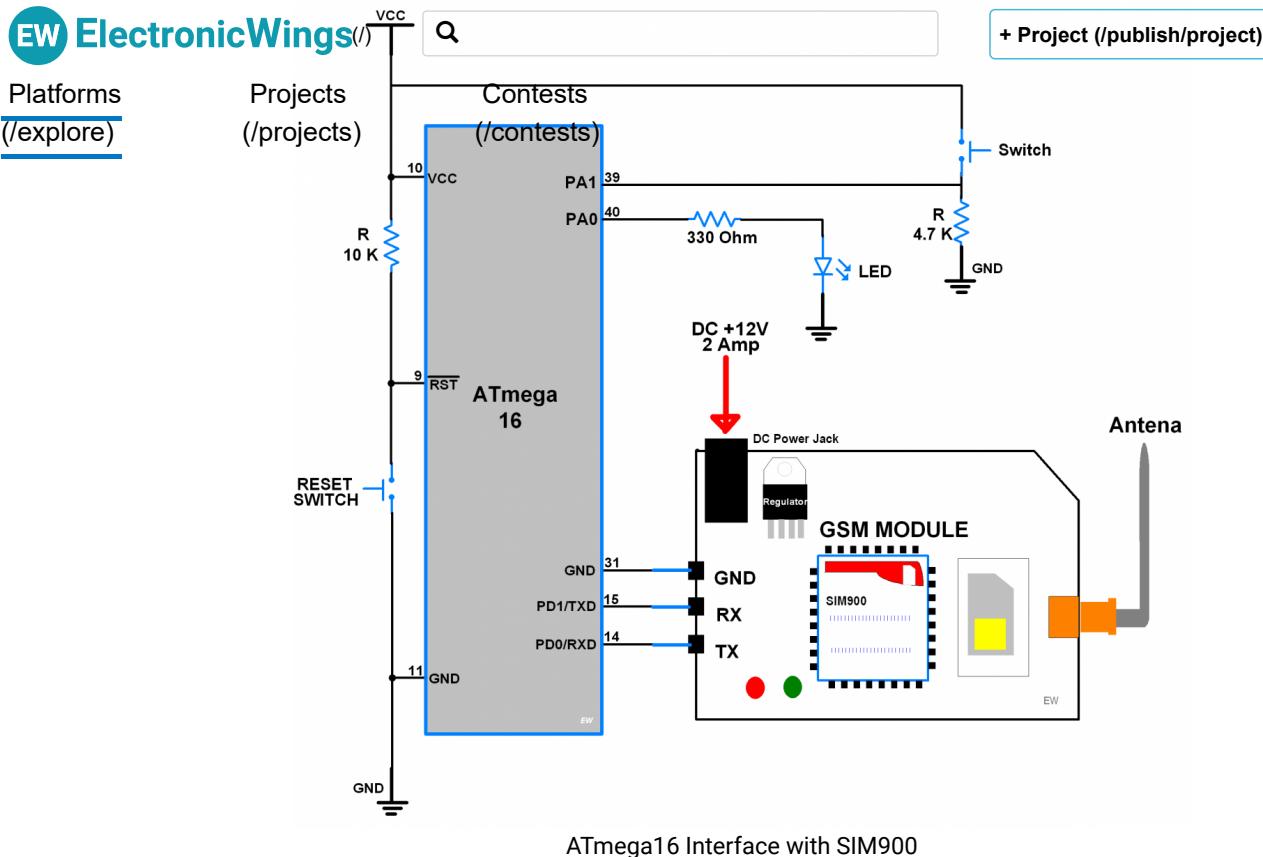
Once we created a dashboard on Adafruit we can add various blocks that can be used to control devices as well as monitor the status of devices. To see more about blocks, refer link <https://learn.adafruit.com/adafruit-io-basics-dashboards/adding-blocks> (<https://learn.adafruit.com/adafruit-io-basics-dashboards/adding-blocks>)

In this example, we have added a toggle button block in the dashboard as shown in the below figure to control LED as well as to know the status of the switch.



Let's interface LED, Switch and SIM900 Module with ATmega16.

Interfacing Diagram



In the below program do the following

For LED Control

```
#define GET_DEMO          /* Define GET demo */
#ifndef POST_DEMO          /* Define POST demo */
```

For Switch Status

```
##define GET_DEMO          /* Define GET demo */
#define POST_DEMO          /* Define POST demo */
```

Define below fields in the given program

```
#define AIO_SERVER "io.adafruit.com"      /* Adafruit server */
#define AIO_BASE_URL  "/api/v2"           /* Base URL for api */
#define AIO_USERNAME "Enter Username" /* Enter username here */
#define AIO_KEY     "Enter AIO key"       /* Enter AIO key here */
#define AIO_FEED    "Enter Feed Key"     /* Enter feed key */

#define APN      "internet"             /* APN of network service provider */
#define USERNAME ""
#define PASSWORD ""
```

Building the URL parameter for Adafruit IO dashboard

For **HTTPClient GET** operation we need to use below URL format

io.adafruit.com/api/v2/AIO_Username/feeds/AIO_feed_key/data?x-aio-key=AIO_key

ElectronicWings⁽¹⁾

to get last updated data only use

io.adafruit.com/api/v2/AIO_Username/feeds/AIO_feed_key/data/last?x-aio-

[+ Project \(/publish/project\)](#)Platforms
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(/contests)For HttpClient POST operation we need to **set** below URL first

io.adafruit.com/api/v2/AIO_Username/feeds/AIO_feed_key/data?x-aio-key=AIO_key

and then post data only afterword's in **JSON** format given below

```
{
    "value": "string",
    "created_at": "string",
    "lat": "string",
    "lon": "string",
    "ele": "string",
    "epoch": 0
}
e.g.
{"value": "your data", "created_at": "2050-01-01T00:00:00Z", "lat": 0, "lon": 0, "ele": 0}
```

Program for HTTP Client with Adafruit Dashboard

```
/*
 * ATmega16_GPRS_HttpClient
 * http://www.electronicwings.com
 */

#define F_CPU 8000000UL      /* Define CPU clock Frequency e.g. here */
#include <avr/io.h>          /* Include AVR std. library file */
#include <string.h>           /* Include string library */
#include <stdio.h>            /* Include standard IO library */
#include <stdlib.h>           /* Include standard library */
#include <stdbool.h>          /* Include standard boolean library */
#include <util/delay.h>         /* Include delay header file */
#include <avr/interrupt.h>       /* Include avr interrupt header file */
#include "USART_RS232_H_file.h" /* Include USART header file */

#define SREG _SFR_IO8(0x3F)

#define DEFAULT_BUFFER_SIZE 200 /* Define default buffer size */
#define DEFAULT_TIMEOUT 10000  /* Define default timeout */
#define DEFAULT_CRLF_COUNT 2   /* Define default CRLF count */
```

Video of Control the LED using GPRS and ATmega16


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Components Used

 Mouser Electronics
(https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

ATmega 16
ATmega 16

X 1

 (https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7lq%2FgITS0tALAx6fMenLvg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

 Datasheet (</components/atmega-16/1/datasheet>)



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MOUSER ELECTRONICS
(https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Atmega32
Atmega32

x 1

Buy (https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrrBurbvGdpkmjg7RWmsQ%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (/components/atmega32/1/datasheet)

CP2103 USB TO UART BRIDGE

CP2103 is single chip USB to UART Bridge. It su...

x 1

Buy (https://www.mouser.com/ProductDetail/Silicon-Labs/CP2103-GMR?qs=Zq62GxwlckYrXEgTuxpNRg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (/components/cp2103-usb-to-uart-bridge/1/datasheet)

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(https://www.mouser.in?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Components Used

Powered By
Mouser Electronics

SIM900A GSM GPRS Module

SIM900A is dual band GSM/GPRS 900/1800MHz module...

X 1

(https://www.mouser.com/ProductDetail/M5Stack/M031-D?qs=%2Fha2pyFadugEKx3cUjc5DGB4hxkc1iwAkV7YxEmv6c%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/sim900a-gsm-gprs-module/1/datasheet>)

Downloads

ATmega16 GPRS HTTP Client Source files

Dow (</api/download/platform/arm-attachment/374>)

SIM900 AT Commands

Dow (</api/download/platform/arm-attachment/375>)

SIM900 HTTP Command User Guide

Dow (</api/download/platform/arm-attachment/376>)

Comments


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mejunkie
(/users/mejunkie/profile)
2017-10-08 04:11:47

Hello,

How to store and display (in other uart) the response of Sim900 module ?

I mean if i sent the AT command AT+SAPBR=2,1 then i will get the response of GPRS context. I want to store the response in a buffer and display it through other UART.

Thanks

[Reply](#) [Like](#)



lokeshc
(/users/lokeshc/profile)
2017-10-08 05:53:28

@Junkie madi: If you want a response of SIM900 module in another buffer, you can copy it from ISR (Interrupt Service Routine) in above program.

[Reply](#) [Like](#)



mejunkie
(/users/mejunkie/profile)
2017-10-09 06:51:24

@Lokesh Chandak: hi, when i use the below snippet in while loop, the code dont enter in main loop. Nothing executes when i use the below code.

```
#ifdef POST_DEMO /* POST Sample data on server */
memset(_buffer, 0, 100);
sprintf(_buffer, "field1=%d",Sample++);

HTTP_Post(_buffer,responseLength);
DELAY_ms(15000); /* Thingspeak server delay */
#endif
```

But if i comment the code above, the code enters and all the parameters is executing as needed.

Please correct me.

[Reply](#) [Like](#) 1 ⌂

lokeshc

(/users/lokeshc/profile)
2017-10-10 00:35:17

@Junkie madi: make sure that you have uncommented only either method i.e. GET_demo or POST_demo.

Currently, above example program has only one method support provided at a time. Both method not supported.

Above program works for either Get method or Post method. Because of your query, we get to know that it should work for both methods if required.

Thanks for your query. So, we will update it right now.

Right now you can move the below two lines in #ifdef POST_demo inside while(1) loop,



HTTP_SetURL(URL);
HTTP_Save();

+ Project (/publish/project)

Platforms
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Contests
After making above change, it will work for both methods at a time.
Reply ([/contests](#))

mejunkie
(/users/mejunkie/profile)
2017-10-11 00:52:06



@Lokesh Chandak: Thanks for your reply.

I have sending the AT command AT+GSN to store IMEI number in buffer of char imei[16].

But when am trying to display imei, i always getting the response from buffer as

862631038584444

OK

i don't need this OK. Also if you see the imei buffer is 16 characters only, but how am getting OK is not cleared.

Below code as mentioned to read;

```
int main()
{
    UART1_TxString("AT+GSN\r");
    WaitForExpectedResponse("OK");

    UART1Buffer[ResponseBufferLength-1]='\0';
    strcpy(imei,UART1Buffer);
    UART0_Printf("%s\n\r",imei);
}
```

Remaining code read response are same as your code.

Reply Like

lokeshc
(/users/lokeshc/profile)
2017-10-11 02:48:45



@Junkie madi: You can use strncpy() instead of strcpy() to copy required number of bytes only from response buffer or
modify below function from above program as per your requirement

```
void GetResponseBody(char* Response, uint16_t ResponseLength)
```

Reply Like 1 ⌂

mejunkie
(/users/mejunkie/profile)
2017-10-11 22:42:27



@Lokesh Chandak: Hi, i have query on sending the data to server using post method.

As above mentioned in your code, When am sending the data to the Parser URL, the data sent successfully but in binary format to the parser URL. I want to send the data in text format.

Format:
#;<IMEI>;<date>;<time>;<Temp>;<Humi>

Let me know where am getting wrong.

Reply Like



lokeshc
 (/users/lokeshc/profile)
 2017-10-12 05:00:04

+ Project (/publish/project)



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If you want to send data in text format to the server then you
 can refer below function

```
bool HTTP_SetPost_json() /* Set Json Application format for post */
{
  return HTTP_Parameter("CONTENT", "application/json");
}
```

Just replace "application/json" with "application/text"

Reply Like 1 ⌂

mejunkie
 (/users/mejunkie/profile)
 2017-10-14 04:32:20

@Lokesh Chandak: Hi, there is an issue with Sprintf.

```
sprintf(_buffer,"#;%s;%d-%02d-%02d;%02d:%02d;%s;%s",imei,
(uint16_t)rtc.year,(uint16_t)rtc.month,(uint16_t)rtc.date,(uint16_t)rtc.hour,
(uint16_t)rtc.min,temp,humidity);
```

The print should be like this below one as per sprintf buffer

#;862631038585444;2017-10-13;12:05;32.20;.44.26

But what am getting is this below

#;86263103858544432.20;2017-10-13;12:05;32.20;.44.26

I don't know, why 32.20 is repeating after IMEI.

Where am going wrong?

Reply Like

lokeshc
 (/users/lokeshc/profile)
 2017-10-14 06:56:16

@Junkie madi: try following things

1. check your buffer size at least it should more than it required
2. clear your complete buffer before sprintf
3. take IMEI,temp and humidity string/buffer size more than it required at least by 2 or 3 bytes
4. clear IMEI, temp, humidity buffers completely before copying data to them.
5. make sure about IMEI, temp, humidity strings ended with null.

Reply Like 1 ⌂

mejunkie
 (/users/mejunkie/profile)
 2017-10-15 04:33:55

@Lokesh Chandak: Thanks for your reply.

Am using buffer char imei[16] to store the imei number received in UART buffer.
 I used the below code to store.

```
strncpy(imei,UART1Buffer+1,16);
imei[16]='\0';
```

When am sending the string to the server according to my string format, am getting space/new line character in the format. And remaining everything is fine as per the string.



Platforms
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format is
#:Qimei><year-month-date><hours:mins>temp;humid

[+ Project \(/publish/project\)](#)

Contests
[\(/contests\)](#)

In the above string, there is a space after first two characters i.e before a 8 character.

Tried changing in the code, but nothing seems work.

Where am getting wrong?

I really appreciate your quick response Lokesh.

Thanks.

[Reply](#) [Like](#)

lokeshc
(/users/lokeshc/profile)
2017-10-15 07:43:44

⋮

@Junkie madi: Hello Junkie,

if you get space in your imei buffer before 8 then make sure about UART1Buffer data from where you are copying it. if you still facing it then try to rotate buffer left by one byte and the add it to main string.

and also take care while adding null character to your imei buffer as

imei[16]='\0';

it means your imei buffer has size>17. but you declared buffer size as 16 for which end character should be at imei[15]='\0'

if you still facing issue please share your code snip.

[Reply](#) [Like](#)

mejunkie
(/users/mejunkie/profile)
2017-10-16 05:01:15

⋮

@Lokesh Chandak: Thanks for the reply.

Sharing the snippet below.

char imei[16];

```
int main()
{
```

```
UART1_TxString("AT+GSN\r");
WaitForExpectedResponse("OK");
```

```
strncpy(imei, UART1Buffer+1, 16);
```

```
imei[16]='\0';
```

```
}
```

In ISR, am reading the UART1buffer. And in main function, copying the UART1Buffer to IMEI buffer using strncpy.

IMEI number will be 15 characters.

Let me know if i can share anything else.


[Reply](#)


authorized

[+ Project \(/publish/project\)](#)

Platforms
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Projects [\(/users/authorized/teste\)](/users/authorized/teste)
(/projects) [Contests](#) [\(contests\)](#)

2017-10-17 07:19:46 • Edited

@Junkie madi: hey,

well try junkie..!

you can do it in many ways....!!!

just find your imei start index location and then copy 15 bytes of imei in your
imei buffer

for example,

char imei[16];

```
int main()
{
    UART1_TxString("AT+GSN\r");
    WaitForExpectedResponse("OK");

    for(int i=0; i<strlen(UART1Buffer); i++){
        if('0' <= UART1Buffer[i] && UART1Buffer[i] <= '9'){ //find start index
            strncpy(imei, UART1Buffer+i, 15); //copy imei from uart buffer
            imei[15] = '\0'; //add null character at end
            i = strlen(UART1Buffer); //get out from for loop
        }
    }
}
```

once you get your imei then you can use it in your application where you want

have a nice time..!!

[Reply](#)
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2


pratikshirsat0007

[\(/users/pratikshirsat0007/profile\)](/users/pratikshirsat0007/profile)

2019-01-09 21:32:24 • Edited

I have to show the receive data on Usart

how can i show it in usart and Lcd

i try to show the _buffer value in usart but it shows wrong value

[Reply](#)
[Like](#)


omedulislaminfo

[\(/users/omedulislaminfo/profile\)](/users/omedulislaminfo/profile)

2019-04-20 15:12:29

Thanks Brother

[Reply](#)
[Like](#)


BalajiMS

[\(/users/BalajiMS/profile\)](/users/BalajiMS/profile)

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hey ,

i am currently facing a problem

i need to show you my code (taken from above code the one with thinkspeak and
modified a little)a year ago the modified code worked but now with the new atmega 16 board its not
means the code gets compiled and run till the last line before the data is being
uploaded to thinkspeak and then the int main keeps repeating
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