BAB V
PENGUJIAN SISTEM

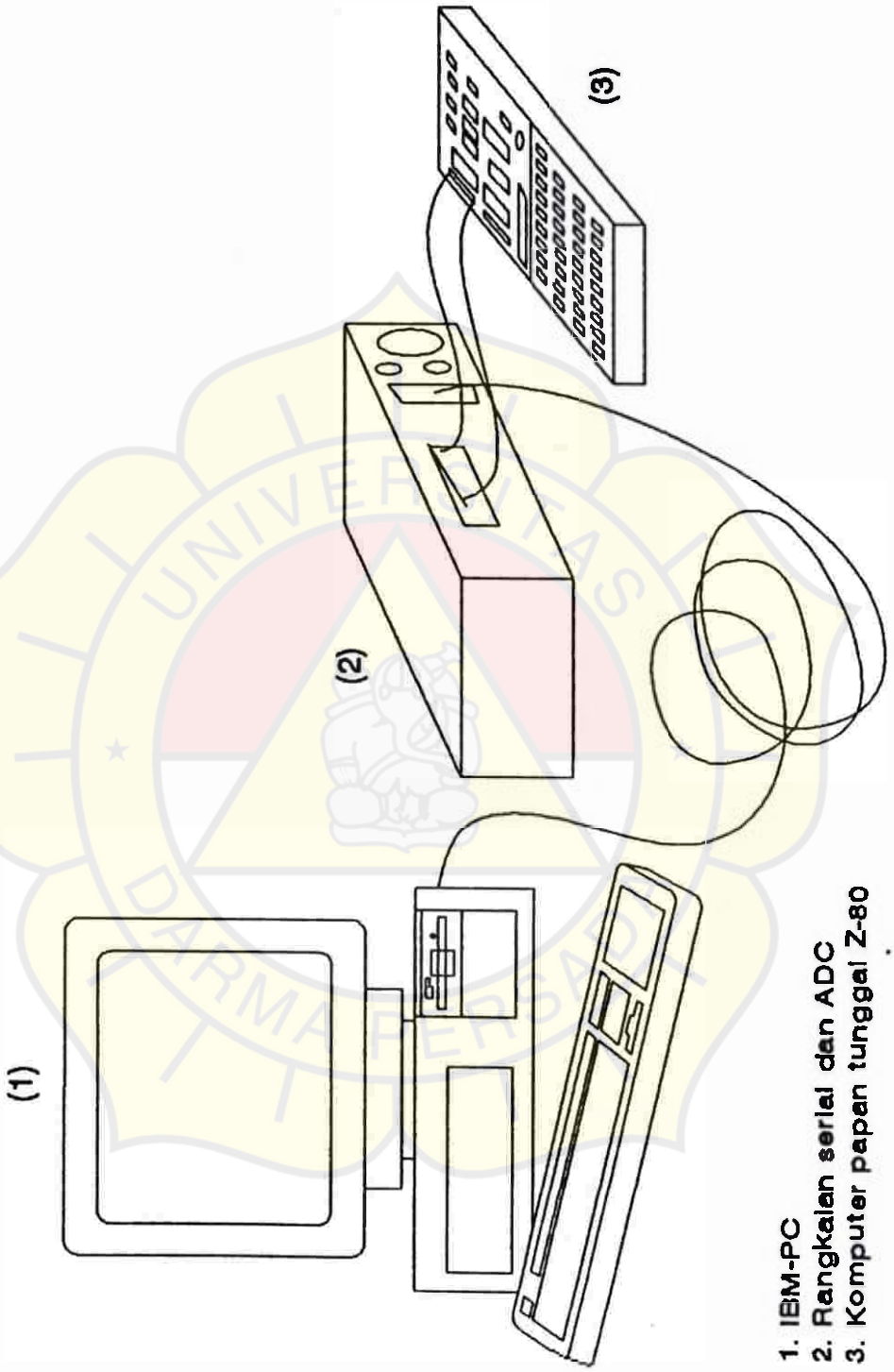
Dalam pengujian sistem ini dilakukan dua kali pengujian. Pertama adalah pengujian sistem komunikasi dengan pengiriman sejumlah data sembarang sedang yang kedua adalah data hasil pengukuran tegangan. Proses komunikasi kedua pengujian dilakukan sesuai dengan inisialisasi pada sub bab inisialisasi pada kecepatan 2400 baud dan jarak ± 34 meter.

5.1 Data Sembarang

Di dalam pengujian ini mencoba untuk melihat kerja perangkat komunikasi dalam mengirim dan menerima data. Perangkat komunikasi berfungsi dengan baik bila data yang dikirim dan diterima adalah sama baik susunan, jumlah dan isi. Jumlah data yang akan dikirimkan dan diterima sebanyak 3500 data.

Tahap-tahap pengujian :

- Menyiapkan perangkat keras.
- Mengisi program kirim data pada komputer papan tunggal Z-80 dengan mengisi kode-kode mesin dengan awal kode mesin pada alamat 1800H. Data sembarang berasal lokasi memori



Gambar 5.1 Pengujian sistem dengan data sembarang.

pada alamat awal 1A00H - 27ABH.

- Setelah pengisian kode mesin program pada komputer papan tunggal Z-80 selesai tahap selanjutnya adalah memasukan disket yang berisi prosedur terima data pada IBM-PC di drive yang dipilih.
- Lalu ketikan MENU, maka akan tampil kotak Menu Pilihan seperti Gambar 5.2 pilih menu Data Sembarang lalu menu Terima Data Dari Pengirim.

```
Menu Pilihan

[1] Data Sembarang
[2] Data Pengukuran Tegangan
[3] Kembali Ke DOS
```

```
Data Sembarang

[1] Terima Data Dari Pengirim
[2] Lihat Data
[3] Kembali Ke Menu Pilihan
```

Gambar 5.2 MENU.

- Ketikkan baud dan jumlah data yang sesuai dengan pengirim.
- Lalu tekan tombol GO pada komputer papan tunggal Z-80.
- Setelah proses selesai, data yang diterima disimpan dalam

media penyimpan. Data dapat dilihat dengan masuk ke menu Lihat Data, maka akan masuk ke menu ChiWriter lalu tekan tombol R. Selanjutnya data dapat dilihat dan diperiksa.

Dari data yang diperoleh ternyata proses komunikasi berjalan dengan baik (tidak terjadi error) dimana data yang diterima sama baik susunan, jumlah, dan isi.

```
Data Dikirimkan Dengan Ketentuan :
- Data Karakter 8 bit
- 2 Bit Stop
- Paritas Genap
Nilai Baud Sebelumnya : 2400
Ingin Mengubah Nilai Baud ?! [Y/T]
```

Data Error		
OE	PE	FE

Gambar 5.3 Terima data dari pengirim

Data yang dikirim :

-0F-90-00-FF-00-FF-EF-C0-AF-E0-00-FF-00-FF-AF-80-DF-70-00-FF
-00-FF-FF-40-9F-F0-00-FF-00-FF-CF-40-BF-60-00-FF-00-FF-9F-E0
-8F-E4-00-FF-00-FF-8F-00-7F-94-00-FF-00-FF-6F-00-5F-F1-00-FF
-00-FF-FF-60-1F-60-00-FF-00-FF-BF-C0-DF-30-00-FF-00-FF-7F-00
-2F-D0-00-FF-00-FF-9F-60-BD-3C-00-FF-00-FF-3F-E0-8F-D8-00-FF
-00-FF-3F-90-0E-90-00-FF-00-FF-FF-90-0F-70-00-FF-00-FF-1F-C0
-6F-F0-00-FF-00-FF-BF-40-BF-10-00-FF-00-FF-DF-E0-0F-F0-00-FF
-00-FF-EF-80-4F-88-00-FF-00-FF-BF-B4-CE-B0-00-FF-00-FF-DF-80
-1F-E0-00-FF-00-FF-4F-80-1F-B4-00-FF-00-FF-8F-90-8F-F0-00-FF
-00-FF-3F-80-2F-D8-00-FF-00-FF-EF-90-AF-E0-00-FF-00-FF-9F-70
-27-30-00-FF-00-FF-CF-F0-07-B2-00-FF-00-FF-FE-50-4F-C0-00-FF
-00-FF-9F-00-8F-B0-00-FF-00-FF-AF-20-1E-F0-00-FF-00-FF-6F-80
-0F-F1-00-FF-00-FF-1F-C0-4F-F0-00-FF-7E-00-EF-B0-EF-20-00-FF
-00-FF-FF-00-1B-B1-00-FF-00-FF-7F-00-6B-B0-00-FF-00-FF-AF-30
-2F-F0-00-FF-00-FF-7F-10-7F-50-00-FF-00-FF-7F-20-9F-B0-00-FF
-00-FF-1F-50-6F-50-00-FF-00-FF-3F-40-0F-B0-00-FF-00-FF-FE-00
-3F-85-00-FF-00-FF-7F-80-1F-C0-00-FF-00-FF-BF-C0-AF-20-00-FF
-00-FF-7F-60-AF-50-00-FF-00-FF-CF-C0-0B-30-00-FF-00-FF-3F-20
-CF-20-00-FF-00-FF-AF-90-07-D4-00-FF-00-FF-FF-C0-9F-70-00-FF
-00-FF-8F-20-2F-B0-00-FF-00-FF-DF-60-0F-C0-00-FF-00-FF-AF-00
-9F-C0-00-FF-00-FF-7F-80-CF-F4-00-FF-00-FF-1F-10-BF-A0-00-FF
-00-FF-3F-C0-2D-E0-00-FF-00-FF-BF-E0-BF-50-00-FF-00-FF-AF-B0
-9F-B0-00-FF-00-FF-DF-20-6F-30-00-FF-00-FF-BF-A0-0B-E0-00-FF
-00-FF-EF-C0-0F-50-00-FF-00-FF-6F-00-0E-B4-00-FF-00-FF-CF-C0
-3F-F0-00-FF-00-FF-AD-60-8F-F1-00-FF-00-FF-1F-40-7F-F2-00-FF
-00-FF-67-40-2E-E0-00-FF-00-80-7F-90-8F-91-00-FF-00-FF-3F-80
-4F-00-00-FF-00-FF-BF-40-8F-B0-00-FF-00-FF-9F-30-0F-A0-00-FF
-00-FF-7F-00-3F-B0-00-F7-00-FF-FF-40-8E-E0-00-FF-00-FF-4F-90
-FF-70-00-FF-00-FF-4F-02-DF-52-00-FF-00-FF-7F-00-EF-E0-00-FF
-00-FF-CF-90-1F-74-00-FF-00-FF-5F-80-DF-80-00-FF-00-FF-FF-00
-5F-C0-00-FF-00-FF-4F-D0-5E-D2-00-FF-00-FF-1F-10-EF-B0-00-FF
-00-FF-CF-00-5F-60-00-FF-00-FF-7F-20-CF-60-00-FF-00-FF-1F-F0
-1F-30-00-FF-00-FF-9F-50-0F-E2-00-FF-00-FF-7F-00-5D-E0-00-FF
-00-FF-8E-00-DF-B0-00-FF-00-FF-BF-50-4F-90-00-FF-00-FF-8F-E0
-17-B1-00-FF-00-FF-EF-20-7D-D0-00-FF-00-FF-BF-60-CF-F4-00-FF
-00-FF-8F-60-9F-90-00-FF-00-FF-0F-70-0F-90-00-FF-00-FF-BF-E0
-1F-F0-00-FF-00-FF-2F-10-0F-50-00-FF-00-FF-CF-90-3D-A0-00-FF
-00-FF-EF-80-1F-D0-00-FF-00-FF-DB-10-0E-D0-00-FF-00-FF-EF-80
-0F-F0-00-F7-FF-00-EF-E0-47-10-00-FF-00-FF-7F-00-4D-40-00-FF
-00-FF-2F-10-7F-F0-00-FF-00-FF-BF-F0-8E-B0-00-FF-00-FF-DF-81
-9B-C0-00-FF-00-FF-BF-10-0F-F0-00-FF-00-FF-DF-40-1F-E0-00-FF
-00-FF-AF-D0-2F-90-00-FF-00-FF-7E-C0-7F-60-00-FF-00-FF-CF-80
-4F-E2-00-FF-00-FF-CF-60-2F-60-00-FF-00-FF-AF-40-33-C8-00-FF
-00-FF-6F-50-DF-B0-00-FF-00-FF-6F-60-07-E0-00-FF-00-FF-9F-80
-CF-70-00-FF-00-FF-EF-00-1F-70-00-FF-00-FF-5F-60-5F-D0-00-FF
-00-FF-EF-80-8D-52-00-FF-00-FF-0F-60-17-50-00-FF-00-FF-EF-00
-0F-F0-00-FF-00-FF-FF-C0-7F-C0-00-FF-00-FF-EF-40-1F-D0-00-FF
-00-FF-7F-10-0F-98-00-FF-00-FF-DF-E0-0F-C0-00-FF-00-FF-8F-C0
-0F-50-00-FF-00-FF-DF-A0-AF-50-00-FF-00-FF-AF-70-4F-E0-00-FF
-00-FF-9F-70-4F-F0-00-FF-00-FF-0B-70-4F-70-00-FF-00-FF-EF-60

-2F-30-00-FF-00-FF-6E-10-0F-71-00-FF-00-FF-DF-80-0F-F0-00-FF
-EE-00-EF-C0-5D-70-00-FF-00-FF-DF-10-EE-00-00-FF-00-FF-FF-10
-8F-90-00-FF-00-FF-5F-E0-2F-B0-00-FF-00-FF-3F-A0-7F-B1-00-FF
-00-FF-7F-80-3F-94-00-FF-00-FF-3F-00-CD-A0-00-FF-00-FF-DF-80
-DF-D0-00-FF-00-FF-FF-08-F7-E0-00-FF-00-FF-AF-C0-EF-01-00-FF
-00-FF-EF-80-3F-20-00-FF-00-FF-F7-E0-AF-D0-00-FF-00-FF-BF-10
-99-F4-00-FF-00-FF-1F-00-0F-92-00-FF-00-FF-7F-20-CE-60-00-FF
-00-FF-FF-A0-5F-38-00-FF-00-FF-EF-D0-4F-F1-00-FF-00-FF-FF-10
-9E-90-00-FF-00-FF-4F-00-CF-10-00-FF-00-FF-0F-80-3E-F0-00-FF
-00-FF-3F-30-5B-F0-00-FF-00-FF-BF-80-0E-C0-00-FF-00-FF-2F-40
-1F-D0-00-FF-00-FF-0D-F0-6D-F0-00-FF-00-FF-4F-70-2F-B0-00-FF
-00-FF-DF-B0-AF-60-00-FF-00-FF-8F-20-9F-E0-00-FF-00-FF-9F-40
-0F-B0-00-FF-00-FF-1F-10-1F-A8-00-FF-00-FF-0F-00-27-70-00-FF
-00-FF-EF-C0-96-F0-00-FF-00-FF-2F-C0-0F-F2-00-FF-FF-00-EF-B0
-5F-00-00-FB-00-FB-EF-00-8F-00-00-FF-00-FF-4F-00-1F-00-00-FF
-00-FF-7F-00-AD-00-00-F5-00-FF-6F-00-C7-00-00-FF-00-FF-5F-00
-FE-00-00-7F-00-FF-FF-00-0F-00-00-FF-00-FF-9D-00-2F-00-00-FF
-00-FF-6F-00-8F-00-00-FF-00-FF-FF-00-BD-00-00-FF-00-FF-EF-00
-5B-00-00-FD-00-FF-CF-00-4F-00-00-BF-00-FF-DF-00-94-00-00-DF
-00-FF-BF-00-BF-00-00-FB-00-FF-BF-00-0F-00-00-FF-00-FF-AF-00
-AF-00-00-FF-00-FB-7F-00-4F-00-00-FF-00-FF-7E-00-9F-00-00-FF
-00-FF-3F-00-0F-00-00-FF-00-FF-2F-00-4F-00-00-44-00-00-18-00
-0E-B6-1F-B7-1F-86-06-77-06-DD-06-94-12-E7-00-00-BF-00-00-FF
-00-FF-CF-FA-BD-BD-BF-30-00-FF-CF-00-2B-00-00-FF-00-F7-5F-00
-CC-00-00-FF-00-FF-5F-00-9F-1F-00-00-00-FE-0F-00-BF-00-00-FF
-00-18-00-18-FF-FF-FF-00-02-A5-01-00-1F-00-FF-F3-C9-FF-66-00
-55-44-2F-00-00-FF-0F-00-5F-00-00-F6-FF-00-0F-00-3E-0F-D3-82
-D3-83-D3-C2-3E-FF-D3-C3-3E-80-D3-C3-C9-3E-00-D3-80-D3-81-D3
-C0-C9-06-35-10-FE-C9-CD-1A-20-CD-11-20-14-ED-51-C9-16-01-CD
-00-20-0E-C1-ED-51-3E-01-D3-80-CD-1F-20-3E-01-D3-80-3E-7F-D3
-C0-CD-1F-20-3E-7F-D3-80-3E-41-D3-C0-CD-1F-20-3E-01-D3-80-3E
-41-D3-C0-CD-1F-20-3E-01-D3-80-3E-41-D3-C0-CD-1F-20-3E-3E-D3
-C0-CD-1F-20-3E-7F-D3-80-CD-1F-20-3E-49-D3-80-3E-7E-D3-C0-CD
-1F-20-3E-49-D3-80-3E-3F-D3-81-3E-09-D3-C0-CD-1F-20-3E-49-D3
-80-3E-40-D3-81-3E-09-D3-C0-CD-1F-20-3E-41-D3-80-3E-40-D3-81
-3E-09-D3-C0-CD-1F-20-3E-40-D3-81-3E-7E-D3-C0-CD-1F-20-3E-7F
-D3-80-3E-3F-D3-81-CD-1F-20-3E-08-D3-80-3E-7F-D3-C0-CD-1F-20
-3E-14-D3-80-3E-7F-D3-81-3E-09-D3-C0-CD-1F-20-3E-22-D3-80-3E
-04-D3-81-3E-19-D3-C0-CD-1F-20-3E-41-D3-80-3E-08-D3-81-3E-29
-D3-C0-CD-1F-20-3E-10-D3-81-3E-46-D3-C0-CD-1F-20-3E-7F-D3-80
-3E-7F-D3-81-CD-1F-20-3E-04-D3-80-3E-7F-D3-C0-CD-1F-20-3E-08
-D3-80-3E-41-D3-81-3E-02-D3-C0-CD-1F-20-3E-10-D3-80-3E-7F-D3
-81-3E-04-D3-C0-CD-1F-20-3E-7F-D3-80-3E-41-D3-81-3E-08-D3-C0
-CD-1F-20-3E-04-D3-C0-CD-1F-20-3E-41-D3-80-3E-1F-D3-81-3E-02
-D3-C0-CD-1F-20-3E-7F-D3-80-3E-20-D3-81-3E-7F-D3-C0-CD-1F-20
-3E-41-D3-80-3E-40-D3-81-CD-1F-20-3E-20-D3-81-3E-7E-D3-C0-CD
-1F-20-3E-7F-D3-80-3E-1F-D3-81-3E-09-D3-C0-CD-1F-20-3E-08-D3
-80-3E-09-D3-C0-CD-1F-20-3E-14-D3-80-3E-7F-D3-81-3E-09-D3-C0
-CD-1F-20-3E-22-D3-80-3E-49-D3-81-3E-7E-D3-C0-CD-1F-20-3E-41
-D3-80-3E-49-D3-81-CD-1F-20-3E-49-D3-81-CD-1F-20-3E-41-D3-81
-CD-1F-20-3E-7F-D3-C0-CD-1F-20-3E-7F-D3-80-3E-7F-D3-81-3E-09
-D3-C0-CD-1F-20-3E-49-D3-80-3E-09-D3-81-3E-09-D3-C0-CD-1F-20

-3E-49-D3-80-3E-19-D3-81 -3E-09-D3-C0-CD-1F-20-3E-49-D3-80-3E
-29-D3-81 -3E-06-D3-C0-CD-1F-20-3E-41 -D3-80-3E-46-D3-81 -CD-1F
-20-3E-7F-D3-C0-CD-1F-20-3E-7F-D3-80-3E-26-D3-81 -3E-49-D3-C0
-CD-1F-20-3E-40-D3-80-3E-49-D3-81 -3E-49-D3-C0-CD-1F-20-3E-40
-D3-80-3E-49-D3-81 -3E-49-D3-C0-CD-1F-20-3E-40-D3-80-3E-49-D3
-81 -3E-41 -D3-C0-CD-1F-20-3E-40-D3-80-3E-72-D3-81 -CD-1F-20-3E
-7F-D3-C0-CD-1F-20-3E-7F-D3-80-3E-41 -D3-81 -3E-09-D3-C0-CD-1F
-20-3E-49-D3-80-3E-7F-D3-81 -3E-19-D3-C0-CD-1F-20-3E-49-D3-80
-3E-41 -D3-81 -3E-29-D3-C0-CD-1F-20-3E-49-D3-80-3E-46-D3-C0-CD
-1F-20-3E-41 -D3-80-3E-01 -D3-81 -CD-1F-20-3E-01 -D3-81 -3E-26-D3
-C0-CD-1F-20-3E-7F-D3-80-3E-7F-D3-81 -3E-49-D3-C0-CD-1F-20-3E
-08-D3-80-3E-01 -D3-81 -3E-49-D3-C0-CD-1F-20-3E-14-D3-80-3E-01
-D3-81-3E-49-D3-C0-CD-1F-20-3E-22-D3-80-3E-32-D3-C0-CD-1F-20
-3E-41 -D3-80-3E-7E-D3-81 -CD-1F-20-3E-09-D3-81 -3E-7E-D3-C0-CD
-1F-20-3E-01 -D3-80-3E-09-D3-81 -3E-09-D3-C0-CD-1F-20-3E-01 -D3
-80-3E-09-D3-81 -3E-09-D3-C0-CD-1F-20-3E-7F-D3-80-3E-7E-D3-81
-3E-09-D3-C0-CD-1F-20-3E-01 -D3-80-3E-7E-D3-C0-CD-1F-20-3E-01
-D3-80-3E-26-D3-81 -CD-1F-20-3E-49-D3-81 -3E-7F-D3-C0-CD-1F-20
-3E-7F-D3-80-3E-49-D3-81 -3E-41 -D3-C0-CD-1F-20-3E-09-D3-80-3E
-49-D3-81 -3E-41 -D3-C0-CD-1F-20-3E-19-D3-80-3E-32-D3-81 -3E-41
-D3-C0-CD-1F-20-3E-29-D3-80-3E-3E-D3-C0-CD-1F-20-3E-46-D3-80
-CD-1F-20-3E-7E-D3-C0-CD-1F-20-3E-3E-D3-80-3E-09-D3-C0-CD-1F
-20-3E-41 -D3-80-3E-09-D3-C0-CD-1F-20-3E-41 -D3-80-3E-09-D3-C0
-CD-1F-20-3E-41 -D3-80-3E-7E-D3-C0-CD-1F-20-3E-3E-D3-80-CD-1F
-20-C3-29-20-16-22-CD-00-20-0E-C1 -ED-51 -3E-80-D3-80-3E-FF-D3
-81-CD-1F-20-3E-80-D3-80-3E-80-D3-81 -CD-1F-20-3E-80-D3-80-3E
-FF-D3-81 -CD-1F-20-3E-07-D3-80-CD-1F-20-3E-84-D3-80-3E-FF-D3
-81 -3E-03-D3-C0-CD-1F-20-3E-9E-D3-80-3E-E2-D3-C0-CD-1F-20-3E
-A5-D3-80-3E-BE-D3-C0-CD-1 F-20-3E-E5-D3-80-3E-FE-D3-81 -3E-BE
-D3-C0-CD-1F-20-3E-A1 -D3-80-3E-12-D3-81 -3E-E2-D3-C0-CD-1F-20
-3E-A1 -D3-80-3E-12-D3-81 -3E-02-D3-C0-CD-1F-20-3E-A1 -D3-80-3E
-12-D3-81 -3E-E2-D3-C0-CD-1F-20-3E-E5-D3-80-3E-02-D3-81 -3E-BE
-D3-C0-CD-1F-20-3E-A5-D3-80-3E-BE-D3-C0-CD-1F-20-3E-9E-D3-80
-3E-E2-D3-C0-CD-1F-20-3E-84-D3-80-3E-FF-D3-81 -3E-03-D3-C0-CD
-1F-20-3E-07-D3-80-CD-1F-20-3E-80-D3-80-3E-FF-D3-81 -CD-1F-20
-3E-80-D3-80-3E-80-D3-81 -CD-1F-20-3E-80-D3-80-3E-FF-D3-81 -CD
-1F-20-C3-DC-23-CD-00-20-0E-C1 -3E-FF-06-00-16-50-D3-80-D3-81
-D3-C0-ED-41 -CD-E9-24-04-15-28-ED-18-F5-08-3A-00-1F-5F-26-48
-25-20-FD-1D-20-F8-08-C9-CD-00-20-CD-11-20-0E-81 -1E-00-3E-22
-16-7E-D3-C1 -ED-51 -CD-1A-20-3C-16-09-ED-59-D3-C1 -ED-51 -CD-1A
-20-3C-D3-C1 -CD-1A-20-3C-D3-C1 -CD-1A-20-16-7E-ED-59-3C-D3-C1
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Data yang diterima :

-0F-90-00-FF-00-FF-EF-C0-AF-E0-00-FF-00-FF-AF-80-DF-70-00-FF
-00-FF-FF-40-9F-F0-00-FF-00-FF-CF-40-BF-60-00-FF-00-FF-9F-E0
-8F-E4-00-FF-00-FF-8F-00-7F-94-00-FF-00-FF-6F-00-5F-F1-00-FF
-00-FF-FF-60-1F-60-00-FF-00-FF-BF-C0-DF-30-00-FF-00-FF-7F-00
-2F-D0-00-FF-00-FF-9F-60-BD-3C-00-FF-00-FF-3F-E0-8F-D8-00-FF
-00-FF-3F-90-0E-90-00-FF-00-FF-FF-90-0F-70-00-FF-00-FF-1F-C0
-6F-F0-00-FF-00-FF-BF-40-BF-10-00-FF-00-FF-DF-E0-0F-F0-00-FF
-00-FF-EF-80-4F-88-00-FF-00-FF-BF-B4-CE-B0-00-FF-00-FF-DF-80
-1F-E0-00-FF-00-FF-4F-80-1F-B4-00-FF-00-FF-8F-90-8F-F0-00-FF
-00-FF-3F-80-2F-D8-00-FF-00-FF-EF-90-AF-E0-00-FF-00-FF-9F-70
-27-30-00-FF-00-FF-CF-F0-07-B2-00-FF-00-FF-FE-50-4F-C0-00-FF
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-00-FF-1F-50-6F-50-00-FF-00-FF-3F-40-0F-B0-00-FF-00-FF-FE-00
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-00-FF-7F-60-AF-50-00-FF-00-FF-CF-C0-0B-30-00-FF-00-FF-3F-20
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-00-FF-8F-20-2F-B0-00-FF-00-FF-DF-60-0F-C0-00-FF-00-FF-AF-00
-9F-C0-00-FF-00-FF-7F-80-CF-F4-00-FF-00-FF-1F-10-BF-A0-00-FF
-00-FF-3F-C0-2D-E0-00-FF-00-FF-BF-E0-BF-50-00-FF-00-FF-AF-B0
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-00-FF-EF-C0-0F-50-00-FF-00-FF-6F-00-0E-B4-00-FF-00-FF-CF-C0
-3F-F0-00-FF-00-FF-AD-60-8F-F1-00-FF-00-FF-1F-40-7F-F2-00-FF
-00-FF-67-40-2E-E0-00-FF-00-80-7F-90-8F-91-00-FF-00-FF-3F-80
-4F-00-00-FF-00-FF-BF-40-8F-B0-00-FF-00-FF-9F-30-0F-A0-00-FF
-00-FF-7F-00-3F-B0-00-F7-00-FF-FF-40-8E-E0-00-FF-00-FF-4F-90

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-00-FF-CF-90-1F-74-00-FF-00-FF-5F-80-DF-80-00-FF-00-FF-FF-00
-5F-C0-00-FF-00-FF-4F-D0-5E-D2-00-FF-00-FF-1F-10-EF-B0-00-FF
-00-FF-CF-00-5F-60-00-FF-00-FF-7F-20-CF-60-00-FF-00-FF-1F-F0
-1F-30-00-FF-00-FF-9F-50-0F-E2-00-FF-00-FF-7F-00-5D-E0-00-FF
-00-FF-8E-00-DF-B0-00-FF-00-FF-BF-50-4F-90-00-FF-00-FF-8F-E0
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-00-FF-8F-60-9F-90-00-FF-00-FF-0F-70-0F-90-00-FF-00-FF-BF-E0
-1F-F0-00-FF-00-FF-2F-10-0F-50-00-FF-00-FF-CF-90-3D-A0-00-FF
-00-FF-EF-80-1F-D0-00-FF-00-FF-DB-10-0E-D0-00-FF-00-FF-EF-80
-0F-F0-00-F7-FF-00-EF-E0-47-10-00-FF-00-FF-7F-00-4D-40-00-FF
-00-FF-2F-10-7F-F0-00-FF-00-FF-BF-F0-8E-B0-00-FF-00-FF-DF-81
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-00-FF-AF-D0-2F-90-00-FF-00-FF-7E-C0-7F-60-00-FF-00-FF-CF-80
-4F-E2-00-FF-00-FF-CF-60-2F-60-00-FF-00-FF-AF-40-33-C8-00-FF
-00-FF-6F-50-DF-B0-00-FF-00-FF-6F-60-07-E0-00-FF-00-FF-9F-80
-CF-70-00-FF-00-FF-EF-00-1F-70-00-FF-00-FF-5F-60-5F-D0-00-FF
-00-FF-EF-80-8D-52-00-FF-00-FF-0F-60-17-50-00-FF-00-FF-EF-00
-0F-F0-00-FF-00-FF-FF-C0-7F-C0-00-FF-00-FF-EF-40-1F-D0-00-FF
-00-FF-7F-10-0F-98-00-FF-00-FF-DF-E0-0F-C0-00-FF-00-FF-8F-C0
-0F-50-00-FF-00-FF-DF-A0-AF-50-00-FF-00-FF-AF-70-4F-E0-00-FF
-00-FF-9F-70-4F-F0-00-FF-00-FF-0B-70-4F-70-00-FF-00-FF-EF-60
-2F-30-00-FF-00-FF-6E-10-0F-71-00-FF-00-FF-DF-80-0F-F0-00-FF
-EE-00-EF-C0-5D-70-00-FF-00-FF-DF-10-EE-00-00-FF-00-FF-FF-10
-8F-90-00-FF-00-FF-5F-E0-2F-B0-00-FF-00-FF-3F-A0-7F-B1-00-FF
-00-FF-7F-80-3F-94-00-FF-00-FF-3F-00-CD-A0-00-FF-00-FF-DF-80
-DF-D0-00-FF-00-FF-FF-08-F7-E0-00-FF-00-FF-AF-C0-EF-01-00-FF
-00-FF-EF-80-3F-20-00-FF-00-FF-F7-E0-AF-D0-00-FF-00-FF-BF-10
-99-F4-00-FF-00-FF-1F-00-0F-92-00-FF-00-FF-7F-20-CE-60-00-FF
-00-FF-FF-A0-5F-38-00-FF-00-FF-EF-D0-4F-F1-00-FF-00-FF-FF-10
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-00-FF-3F-30-5B-F0-00-FF-00-FF-BF-80-0E-C0-00-FF-00-FF-2F-40
-1F-D0-00-FF-00-FF-0D-F0-6D-F0-00-FF-00-FF-4F-70-2F-B0-00-FF
-00-FF-DF-B0-AF-60-00-FF-00-FF-8F-20-9F-E0-00-FF-00-FF-9F-40
-0F-B0-00-FF-00-FF-1F-10-1F-A8-00-FF-00-FF-0F-00-27-70-00-FF
-00-FF-EF-C0-96-F0-00-FF-00-FF-2F-C0-0F-F2-00-FF-FF-00-EF-B0
-5F-00-00-FB-00-FB-EF-00-8F-00-00-FF-00-FF-4F-00-1F-00-00-FF
-00-FF-7F-00-AD-00-00-F5-00-FF-6F-00-C7-00-00-FF-00-FF-5F-00
-FE-00-00-7F-00-FF-FF-00-0F-00-00-FF-00-FF-9D-00-2F-00-00-FF
-00-FF-6F-00-8F-00-00-FF-00-FF-FF-00-BD-00-00-FF-00-FF-EF-00
-5B-00-00-FD-00-FF-CF-00-4F-00-00-BF-00-FF-DF-00-94-00-00-DF
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-D3-C0-CD-1F-20-3E-A1 -D3-80-3E-12-D3-81 -3E-E2-D3-C0-CD-1F-20
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-12-D3-81 -3E-E2-D3-C0-CD-1F-20-3E-E5-D3-80-3E-02-D3-81 -3E-BE
-D3-C0-CD-1F-20-3E-A5-D3-80-3E-BE-D3-C0-CD-1F-20-3E-9E-D3-80
-3E-E2-D3-C0-CD-1F-20-3E-84-D3-80-3E-FF-D3-81 -3E-03-D3-C0-CD

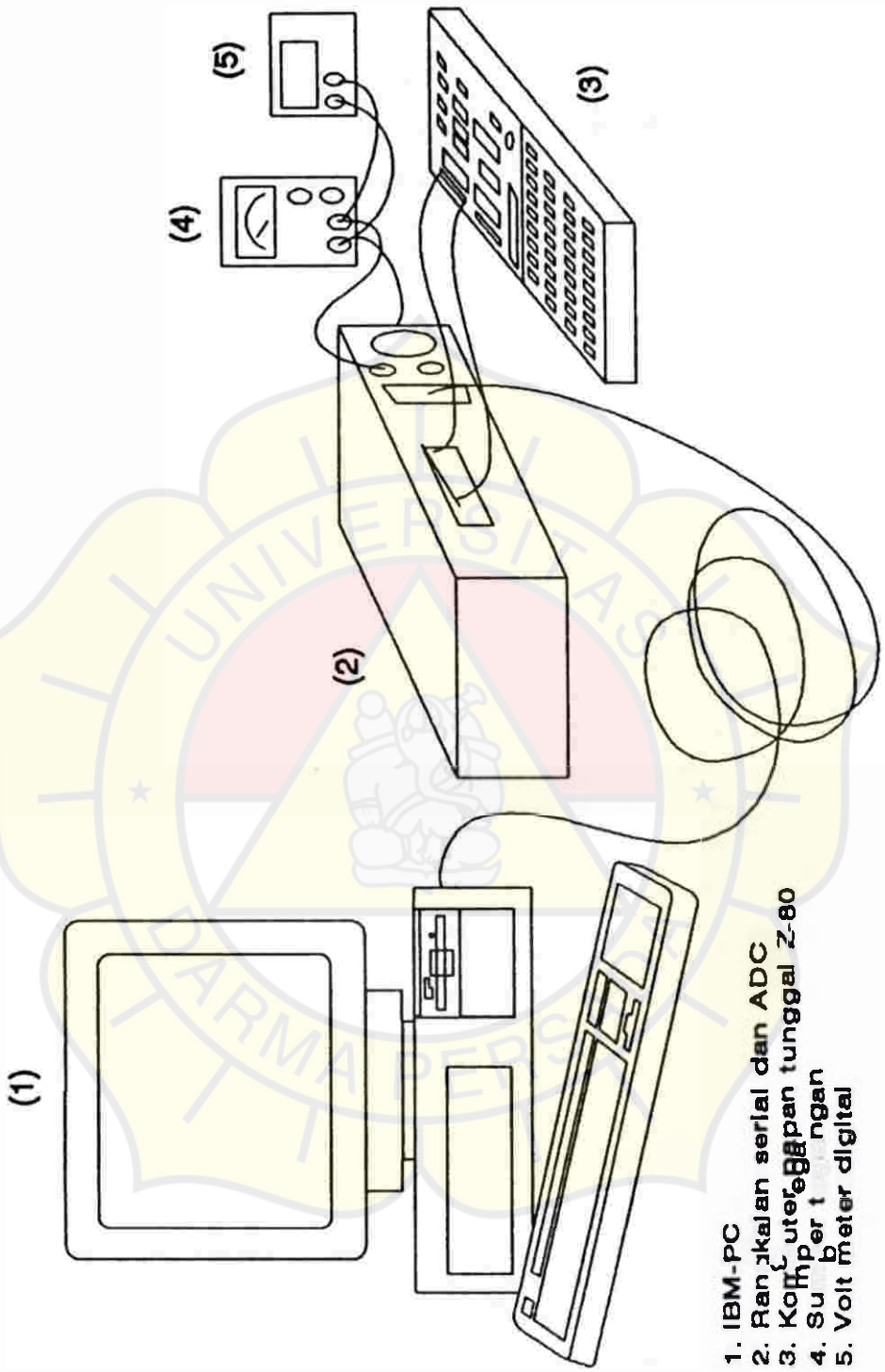
```
-1F-20-3E-07-D3-80-CD-1F-20-3E-80-D3-80-3E-FF-D3-81 -CD-1F-20
-3E-80-D3-80-3E-80-D3-81 -CD-1F-20-3E-80-D3-80-3E-FF-D3-81 -CD
-1F-20-C3-DC-23-CD-00-20-0E-C1 -3E-FF-06-00-16-50-D3-80-D3-81
-D3-C0-ED-41 -CD-E9-24-04-15-28-ED-18-F5-08-3A-00-1F-5F-26-48
-25-20-FD-1D-20-F8-08-C9-CD-00-20-CD-11 -20-0E-81 -1E-00-3E-22
-16-7E-D3-C1 -ED-51 -CD-1A-20-3C-16-09-ED-59-D3-C1 -ED-51 -CD-1A
-20-3C-D3-C1 -CD-1A-20-3C-D3-C1 -CD-1A-20-16-7E-ED-59-3C-D3-C1
-ED-51 -CD-1A-20-C3-F8-24-64-09-01 -01 -00-20-00-00-00-20-00-00
-34-05-0C-41 -3A-5C-5A-38-30-50-55-2E-41 -53-4D-00-00-00-00-00
-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF-FF
```

5.2 Data Pengukuran Tegangan

Dalam pengujian ini data berasal dari pengukuran tegangan analog yang dirubah terlebih dahulu oleh rangkaian ADC sebelum dikirim. Batas pengukuran 0..2,54 Volt.

Tahap-tahap pengujian :

- Menyiapkan perangkat keras.



Gambar 5.4 Pengujian sistem dengan data pengukuran tegangan.

- Atur tegangan Vref ADC sebesar 2,55 Volt dan sumber tegangan yang akan diukur sebesar 1,00 Volt.
- Mengisi program ADC pada komputer papan tunggal Z-80 dengan mengisi kode-kode mesin pada alamat awal 1850H.
- Setelah data program diisikan ke memori maka pada alamat PC (program counter) 1850 tekan tombol GO.
- Setelah data pengukuran tersimpan di memori (alamat 1A00H) komputer papan tunggal Z-80 maka proses pengiriman siap dilakukan dengan masuk pada menu Menu Pilihan.
- Pada Menu Pilihan pilih Data Pengukuran Tegangan yang selanjutnya tampak menu pilihan pada Gambar 5.5.
- Tekan tombol F1 lalu tekan tombol GO pada pengirim.
- Tekan tombol F2 untuk melihat data hasil pengukuran.

Dari hasil yang didapat ternyata pengukuran berjalan dengan baik. Hal dapat dilihat pada hasil pengukuran dimana nilai tegangan sumber tegangan (diukur dengan volt meter digital) sama dengan nilai tampilan pada IBM-PC. Pada Gambar 5.7 adalah hasil yang didapat. Beberapa hasil pengukuran dapat dilihat pada Tabel 5.1.

[F1]-Ambil Data	[F2]-Hasil Pengukuran	[F3]-Keluar

Gambar 5.5 Menu pilihan Data Pengukuran Tegangan.

[F1]-Ambil Data [F2]-Hasil Pengukuran [F3]-Keluar

Data Dikirimkan Dengan Ketentuan :
- Kecepatan 2400 baud
- Data Karakter 8 bit
- 2 Bit Stop
- Paritas Genap

Tekan Tombol "GO" Pada KPT MPF-1

Data Error		
OE	PE	FE

Gambar 5.6 Ambil data hasil pengukuran.

[F1]-Ambil Data [F2]-Hasil Pengukuran [F3]-Keluar

Hasil

1,00 Volt

Gambar 5.7 Hasil pengukuran tegangan.

Tabel 5.1 Hasil beberapa pengukuran tegangan

VIN Volt	VADC Heksa	VIN Volt	VADC Heksa
0	00	1,75	AF
0,10	0A	1,80	B4
0,20	D5	2,13	D5
0,35	23	2,15	D7
0,50	32	2,30	E6
0,60	3C	2,40	F0
0,70	46	2,45	F5
0,85	55	2,50	FA
1,00	64	2,52	FC
1,20	78	2,54	FE

KESIMPULAN

1. Sistem komunikasi data serial asinkron satu arah antara IBM-PC dengan komputer papan tanggal Z-80 berlangsung dengan baik (tanpa error). Hal ini dapat dilihat pada proses pengiriman dan penerimaan 3500 data melalui media transmisi kabel tambaga. Data yang dikirim dan yang diterima baik jumlah, susunan, dan nilai adalah sama. Komunikasi berlangsung sejauh ± 34 meter antara pengirim dan penerima pada kecepatan 2400 baud.
2. Perangkat lunak berperan penting untuk mengendalikan proses komunikasi. Khusus pada baris instruksi perangkat lunak bagian pemindahan data karakter dari CPU ke komponen komunikasi (UART dan USART) dan sebaliknya, diusahakan sependek mungkin. Bila tidak maka perubahan kecepatan baud tidak tampak atau malah mengganggu proses komunikasi.
3. Dari pengujian sistem dengan data pengukuran tegangan, sistem dapat dikembangkan sebagai perangkat pengukuran yang lebih luas dengan menambah perangkat sensor. Menggunakan perangkat ini pengukuran dapat berlangsung relatif jauh dibandingkan pengukuran menggunakan IBM-PC pada hubungan paralel.

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LAMPIRAN I : PROGRAM KIRIM DATA

```
******* PROGRAM KIRIM DATA KPT MPF-1 *******

1800 ---> 3E 3E              LD A, 3E     ; Insialisasi
  02 ---> D3 FF              OUT(FF), A     PIT 8253
  04 ---> 3E 2E              LD A, 2E     ; Nilai cacahan
  06 ---> D3 FC              OUT(FC), A     diisi LSB dahulu
  08 ---> 3E 00              LD A, 00       baru MSB
  0A ---> D3 FC              OUT(FC),A
  0C ---> 3E FE              LD A, FE     ; Insialisasi
  0E ---> D3 BD              OUT(BD),A      USART 8251
  10 ---> 3E 11              LD A, 11
  12 ---> D3 BD              OUT(BD),A
  14 ---> 01 AC 0D           LD BC, 0DAC  ; Jumlah data
  17 ---> 11 00 1A           LD DE, 1A00    3500 pada alamat
                                            awal 1A00H

  1A ---> DB BD       LOOP : IN A,(BD)    ; Periksa bit 0
  1C ---> CB 47              BIT 0,A        pada register
  1E ---> CA 1A 18           JPZ LOOP       status

  21 ---> 1A                 LD A, (DE)   ; Ambil data
  22 ---> D3 BC              OUT(BC),A      lalu kirimkan
  24 ---> 13                 INC DE       ; Ulangi proses
  25 ---> 0B                 DEC BC         sebanyak isi
  26 ---> 79                 LD A, C        nilai desimal
  27 ---> B0                 ORB            register BC
  28 ---> C2 1A 18           JPNZ LOOP
  2B ---> CD A0 18           CALL DELAY
  2E ---> 3E 40              LD A, 40     ; Reset internal
  30 ---> D3 BD              OUT(BD),A
  32 ---> 76                 HALT         ; Berhenti


********** PROGRAM ADC ****************

  50 ---> 11 00 1A           LD DE, 1A00  ; Alamat data
  53 ---> 3E 00              LD A, 00     ; Pilih input analog
  55 ---> D3 C0              OUT(C0),A      pada saluran 0
  57 ---> F5                 PUSH AF      ; Delay
  58 ---> 3E 0D              LD A, 0D
  5A ---> 3D          LOOP :DEC A
  5B ---> C2 5A 18           JPNZ LOOP
  5E ---> F1                 POP AF
  5F ---> DB Co              IN A,(C0)    ; Ambil data, simpan
  61 ---> 12                 LD (DE), A     alamat data
  62 ---> 76                 HALT         ; Berhenti
```

```
18A0 ──→ F5
  A1 ──→ C5
  A2 ──→ 06 1A
  A4 ──→ 3E FF
  A6 ──→ 3D
  A7 ──→ C2 A6 18
  AA ──→ 10 F8
  AC ──→ C1
  AD ──→ F1
  AE ──→ C9
```

```
DELAY:  PUSH AF
        PUSH BC
        LD B, 06
LOOP1:  LD A, FF
LOOP2:  DEC A
        JPNZ LOOP2
        DJNZ LOOP1
        POP BC
        POP AF
        RET
```

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LAMPIRAN II : PROGRAM TERIMA DATA

```
*****************************************************************
Program ini berfungsi untuk memilih Data Sembarang
(Menu_Dat.exe) atau Data Pengukuran Tegangan (Menu_Teg.exe).
*****************************************************************

Program Menu;

Uses Crt,Dos, video;
{$M 2048,0,8200}

Procedure MenuPilihan;
Var
  Kode                      : Word;
  Selesai                   : Boolean;
  i, BrsAwal,kolomAwal,
  PilihanBaru,PilihanLama : Byte;

Const  Panah_Atas   = 256+72; Panah_Bawah = 256+80;
       Enter        = 13; J   umPilihan   = 3;

   InfoPilihan  : Array[1..JumPilihan] Of String[35]
                = ('[1] Data Sembarang',
                   '[2] Pengukuran Tegangan',
                   '[3] Kembali Ke DOS');

Procedure VideoNormal;
Begin
    TextAttr := $1F;
End;

Procedure VideoTerbalik;
Begin
   TextAttr := $71;
end;

Begin
  Clrscr;
  BikinJendela('Menu Pilihan',22,5,57,13, 4,  '*', $1F, $1F);
  ModeKursor(Sembunyi);
  BrsAwal    := 2;
  KolomAwal  := 2;
  Selesai    := False;
  VideoTerbalik;
  GotoXY(BrsAwal,KolomAwal);
  Write(InfoPilihan[1]);
  VideoNormal;
  For i := 2 To JumPilihan Do
     Begin


       GotoXY (BrsAwal,KolomAwal+i-1);
```

```
        GotoXY (BrsAwal,KolomAwal+i-1);
        Write (InfoPilihan[i]);
      End;
PilihanBaru := 1;
Repeat
{Baca Tombol}
  Repeat
    Kode := Ord(Readkey);
    If Kode = 0 Then
       Kode := 256 + Ord(Readkey);
Until (Kode = Enter) Or (Kode = PanaH_Atas) Or
      (Kode = Panah_Bawah) Or (Kode In [49..51]);
PilihanLama := PilihanBaru;
Case Kode Of
     Panah_Atas   : If PilihanBaru  = 1 Then
                       PilihanBaru := JumPilihan
                    Else Dec (PilihanBaru);
     Panah_Bawah  : If PilihanBaru = JumPilihan Then
                       PilihanBaru := 1
                    Else Inc (PilihanBaru);
     49..51       : PilihanBaru := Kode-48;
end;
If PilihanLama <> PilihanBaru Then
   Begin
     GotoXY(BrsAwal,KolomAwal+PilihanLama-1);
     Writeln(InfoPilihan[PilihanLama]);
     VideoTerbalik;
     GotoXY(BrsAwal,KolomAwal+PilihanBaru-1);
     Writeln(InfoPilihan[PilihanBaru]);
     VideoNormal;
   End;

If (PilihanBaru = 3) And (Kode = Enter) Or (KOde = 51) Then
    Selesai := True
Else
    If Not ((KOde = Panah_Atas) Or (Kode = Panah_Bawah)) Then
    Begin
       BikinJendela('',1,1,80,25,  0,#32,  7,  7);
       MOdeKursor(Normal);
       Write(' Tunggu.......');
       Case PilihanBaru Of
          1 : EXEC ('Menu_dat.Exe','');
          2 : EXEC ('Menu_Vol.Exe','');
       End;
       If DosError <>  0 Then
        Begin
          Clrscr;
          Writeln('Ada Kesalahan. SubProses(Pilihan)tidak  bisa
          dijalankan.');
          Writeln('Kode Kesalahan :',DosError,'');
          Write('Tekan ENTER');
          Repeat Until Readkey = #13;
        End;
        HapusJendela;
       End;
Until Selesai;
```

```
    HapusJendela;
End;
Begin
   clrscr;
   Hapusjendela;
   MenuPilihan;
End.
```

```
*****************************************************************
Program ini berfungsi untuk memilih TerimaData Dari Pengirim
(Load_Dat.exe) atau Lihat Data ( pengolah kata ChiWriter).
*****************************************************************
```

```
Program Menu_Dat;
```

Program ini sama dengan program menu.pas hanya baris program di bawah ini yang diganti.

```
  InfoPilihan   : Array[1..JumPilihan] Of String[35]
                = ('[1] Terima Data Dari Pengirim',
                   '[2] Lihat Data',
                   '[3] Kembali Ke Menu Pilihan');

       Case PilihanBaru Of
          1 : EXEC ('Load_dat.Exe''');
          2 : EXEC ('cw.exe','');
       End;
```

```
*****************************************************************
Program ini berfungsi untuk mengatur proses komunikasi
sesuai dengan inisialisasi dimana IBM-PC menerima data
sembarang dari komputer papan tunggal Z-80. Setelah semua
data diterima data disimpan di dalam sebuah file.
*****************************************************************
```

```
Program Load_Dat;

Uses
   Crt,Dos;
Const
    Tx_Buffer              =      $02F8;
    Rx_Buffer              =      $02F8;
    Baud_Div_Lsb           =      $02F8;
    Baud_Div_Msb           =      $02F9;
    Line_Control_Reg       =      $02FB;
    Modem_Control_Reg      =      $02FC;
    Line_Status_Reg        =      $02FD;
    Modem_Status_Reg       =      $02FE;

    Maksimum               =      10000;
    f_Kristal  = 1843200;
    Data_Heksa        : Array[0..15] of String[8]
                    = ('0','1','2','3','4','5','6','7','8',
                       '9','A','B','C','D','E','F');
    Data_Heks         : Array[0..255] of String[4] =
```

```
('00','01','02','03','04','05','06','07','08','09','0A',
 '0B','0C','0D','0E','0F','10','11','12','13','14','15',
 '16','17','18','19','1A','1B','1C','1D','1E','1F','20',
 '21','22','23','24','25','26','27','28','29','2A','2B',
 '2C','2D','2E','2F','30','31','32','33','34','35','36',
 '37','38','39','3A','3B','3C','3D','3E','3F','40','41',
 '42','43','44','45','46','47','48','49','4A','4B','4C',
 '4D','4E','4F','50','51','52','53','54','55','56','57',
 '58','59','5A','5B','5C','5D','5E','5F','60','61','62',
 '63','64','65','66','67','68','69','6A','6B','6C','6D',
 '6E','6F','70','71','72','73','74','75','76','77','78',
 '79','7A','7B','7C','7D','7E','7F','80','81','82','83',
 '84','85','86','07','88','89','0A','8B','8C','8D','8E',
 '8F','90','91','92','93','94','95','96','97','98','99',
 '9A','9B','9C','9D','9E','9F','A0','A1','A2','A3','A4',
 'A5','A6','A7','A8','A9','AA','AB','AC','AD','AE','AF',
 'B0','B1','B2','B3','B4','B5','B6','B7','B8','B9','BA',
 'BB','BC','BD','BE','BF','C0','C1','C2','C3','C4','C5',
 'C6','C7','C8','C9','CA','CB','CC','CD','CE','CF','D0',
 'D1','D2','D3','D4','D5','D6','D7','D8','D9','DA','DB',
 'DC','DD','DE','DF','E0','E1','E2','E3','E4','E5','E6',
 'E7','E8','E9','EA','EB','EC','ED','EE','EF','F0','F1',
 'F2','F3','F4','F5','F6','F7','F8','F9','FA','FB','FC',
 'FD','FE','FF');

Type
    Data                    = Array[0..Maksimum] of Byte;
Var
    Data_Karakter                                  : Data;
    i,x,a,b,c,d,Salah,z                            : Integer;
    Status,Transit,Isi_Port                        : Word;
    Fileteks,Fileteks2,File_C_Baud    : Text;
    data_teks                       : Array[1..10000] of Integer;
    Data_string,Data_String2,E,F      : String[8];
    C_Baud, Variabel_Baud,N_Heksa,Baud_X           : Longint;
    Baud_Lsb_1,Baud_Lsb_2,
    Baud_Msb_3, Baud_Msb_4,
    Baud_Lsb_1_Numeric,Baud_Lsb_2_Numeric,
    Baud_Msb_3_Numeric,Baud_Msb_4_Numeric,
    Baud_1,Baud_2, Baud_3,Baud_4,
    Baud_Lsb,Baud_Msb,E1,E2,
    Baud_Lsb_Numeric,baud_Msb_Numeric              : Integer;
    Pilihan,Pilihan2                               : Char;

Procedure TulisJam;
Var awalX,awalY : Byte;
    Jam,Menit,Detik,Detik_100,Sem : Word;
Begin
GETTIME(Jam, Menit,Detik,Detik_100);
If Sem <> Detik Then
   Begin
     Write(Jam:2,':', Menit:2,':',Detik:2,':',Detik_100);
     Sem := detik;
   End;
End;
```

```
Procedure Terima_Karakter;
Begin
    Repeat
       Status := Portw[Line_Status_Reg];
      If (Status And $03) = $03 Then
        Begin
         a := a+1;
         GotoXY(32,20);
         Write('',a,'');
         GotoXY(1,1);
        End;
       Status := Portw[Line_Status_Reg];
     If (Status And $05) = $05 Then
        Begin
         b := b+1;
         GotoXY(39,20);
         Write('',b,'');
         GotoXY(1,1);
        End;
      Status := Portw[Line_Status_Reg];
     If (Status And $09) = $09 Then
        Begin
         c := c+1;
         GotoXY(46,20);
         Write('',c,'');
         GotoXY(1,1);
        End;
    Until (Status And $01) = $01;
    Isi_Port := Portw[Tx_Buffer];
End;

Procedure Ambil_Nilai_baud( Baud_Lsb_1,Baud_Lsb_2,
                            Baud_Msb_3, Baud_Msb_4,C_Baud :Integer);
Begin
   baud_Lsb_1_Numeric := Baud_Lsb_1;
   baud_Lsb_2_Numeric := Baud_Lsb_2;
   baud_Msb_3_Numeric := Baud_Msb_3;
   baud_Msb_4_NUmeric := Baud_Msb_4;
   Baud_Lsb := Baud_Lsb_2_Numeric*16 + Baud_Lsb_1_Numeric;
   Baud_Msb := Baud_Msb_4_Numeric*16 + Baud_Msb_3_Numeric;
  Writeln('Baud Lsb  $',Data_Heks[Baud_Lsb]'');
  Writeln('Baud Msb  $',Data_Heks[Baud_Msb],'');
  Portw[Line_Control_Reg] := $80;
  Portw[Baud_Div_Lsb]     := Baud_Lsb;
  Portw[Baud_Div_Msb]     := Baud_Msb;
  Portw[Line_Control_Reg] := $1F;
  EXIT
End;

Procedure Inisialisasi_8250;
Begin
  Assign (File_C_Baud,'C_Baud.rnt');
    Reset (File_C_Baud);
    Repeat
      Readln(File_C_Baud,C_Baud);
    Until EOF (File_C_Baud) = True;
```

```
    Close(File_C_Baud);
    Writeln('Data Dikirimkan Dengan Ketentuan :');
    Writeln('- Data Karakter 8 bit');
    Writeln('- 2 Bit Stop');
    Writeln('- Paritas Genap');
    Writeln('Nilai Baud Sebelumnya : ',C_Baud,'');
Write('Ingin Mengubah Nilai Baud ?! [Y/T]');
Readln(Pilihan);;
If  (Pilihan = 'Y')or(Pilihan = 'y') Then
 Begin
  Assign(File_C_Baud,'C_Baud.rnt');
  Rewrite(File_C_Baud);
      Write('Nilai Baud Baru        : ');
  Read(C_Baud);
  Write(File_C_Baud,C_Baud);
  Close(File_C_Baud);
 End;
  Variabel_Baud := 16 * C_Baud;
  Baud_X := f_Kristal DIV Variabel_Baud;
If Baud_X >= 16 Then
   Begin
   Baud_1 := Baud_X DIV 16;
   Baud_Lsb_1 := Baud_X - (Baud_1*16);
   End
   Else
     Begin
       Baud_Lsb_1 := Baud_X;
       Baud_Lsb_2 := 0;
       Baud_Msb_3 := 0;
       Baud_Msb_4 := 0;
       ambil_Nilai_Baud( Baud_Lsb_1,Baud_Lsb_2,
                         Baud_Msb_3,Baud_Msb_4,C_Baud );
       EXIT
       End;
If Baud_1 >= 16 Then
       Begin
       Baud_2 := Baud_1 DIV 16;
       Baud_Lsb_2 := Baud_1 - (Baud_2*16);
       End
    Else
      Begin
         Baud_Lsb2 := Baud_1;
         Baud_Msb_3 := 0;
         Baud_Msb_4 := 0;
         Ambil_Nilai_Baud( Baud_Lsb_1,Baud_Lsb_2,
                           Baud_Msb_3, Baud_Msb_4,C_Baud );
         EXIT
     End;
If Baud_2 >= 16 Then
      Begin
      Baud_3 := Baud_2 DIV 16;
      Baud_Msb_3 := Baud_2 - (Baud_3*16);
      End
   Else
      Begin
        Baud_Msb_3 := Baud_2;
```

```
          Baud_Msb_4 := 0;
          Ambil_Nilai_Baud( Baud_Lsb_1,Baud_Lsb_2,
                            Baud_Msb_3,Baud_Msb_4,C_Baud );
          EXIT
        End;
If Baud_3 >= 16 Then
      Begin
      Baud_4 := Baud_3 DIV 16;
      Baud_Msb_4 := Baud_3 - (Baud_4*16);
      End
  Else
      Begin
       Baud_Msb_4 := Baud_4;
       Ambil_Nilai_Baud( Baud_Lsb_1,Baud_Lsb_2,
                         Baud_Msb_3,Baud_Msb_4,C_Baud );
      EXIT
      End;
ambil_Nilai_baud( Baud_Lsb_1,Baud_Lsb_2,
                  Baud_Msb_3,Baud_Msb_4,C_Baud );
End;

Procedure Terima_data;
Begin
    Inisialisasi_8250;
    z := 1;
    x := 0;
    i := 0;
    Write('Jumlah Data : ');
    Read(d);
    Writeln('Tekan Tombol "GO" Pada KPT MPF-1');
    GotoXY(70,1);
    TulisJam;
    GotoXY(1,1);
    For i:=1 To d Do
    Begin
       x := x + 1;
       Terima_karakter;
       DATA_KARAKTER[I] := ISI_PORT;
       DATA_Teks[I] := ISI_PORT;
       GotoXY(25,13);
       write('Jumlah Data Yang Diterima ',x,');
       Portw[Modem_Control_Reg] := $00;
   End;
End;

Procedure Simpan_data;
Begin
    Assign(Fileteks,'Desimal.dta');
    Assign(Fileteks2,'Heksa.dta');
    Rewrite(Fileteks);
    Rewrite(Fileteks2);
    z := 1;
    x := 0;
    i := 0;
    For i:=1 To d Do
    Begin
```

```
        x := x + 1;
        Str(Data_Karakter[i],Data_String);
        E : = ' - ';
        E := Concat(E,Data_String);
        F := ' - ';
        F := Concat(F,Data_Heks[Data_Teks[i]]);
      If (i = 20) or (i = 20*z) then
      Begin
        writeln(Fileteks,E);
        writeln(Fileteks2,F);
        z:=z+1;
      end
      Else
        begin
         Write(Fileteks,E);
         Write(Fileteks2,F);
        end;
   End;
         Close(Fileteks);
         Close(Fileteks2);
End;

Procedure Rangka ;
Begin
GotoXY(28,15);
Writeln('                                    ');GotoXY(28,16);
Writeln('          Data Error                ');GotoXY(28,17);
Writeln('                                    ');GotoXY(28,18);
Writeln('     OE        PE        FE         ');GotoXY(28,19);
Writeln('                                    ');GotoXY(28,20);
Writeln('                                    ');GotoXY(28,21);
Writeln('                                    ');GotoXY(28,22);
Writeln('                                    ');
End;
Begin
    Clrscr;
    Portw[Line_Status_Reg] := $00;
    a:=0; b:=0; c:=0;
    Status: =0;
    Rangka;
    GotoXY(1,1);
    Terima_Data;
    GotoXY(70,2);
    TulisJam;
    Simpan_data;
    GotoXY(24,24);
    Write('Untuk Kembali Ke Menu Tekan Enter');
    Repeat Until Readkey = #13;
End.
```

```
*****************************************************************
Program ini berfungsi untuk memilih prosedur Ambil Data dari
pengirim atau prosedur Lihat Data.
Prosedur Ambil Data ini fungsinya untuk mengambil data hasil
pengukuran tegangan sedangkan prosedur Lihat Data untuk
melihat hasil pengukuran.
*****************************************************************

Program Menu_Teg;
Uses Crt,Video;
Const
     Tx_Buffer              =      $02F8;
     Rx_Buffer              =      $02F8;
     Baud_Div_Lsb           =      $02F8;
     Baud_Div_Msb           =      $02F9;
     Line_Control_Reg       =      $02FB;
     Modem_Control_Reg      =      $02FC;
     Line_Status_Reg        =      $02FD;
     Modem_Status_Reg       =      $02FE;

Var
    i,j,k,y,z,q,Periksa,a,b,
    gm,gd,r,s                   : Integer;
    Pilihan,x                   : Char;
    TombolPerluasan             : Boolean;
    Data_Volt                   : Byte;
    N,O,P                                   : Integer;
    Status,Transit,Isi_Port,Data_Vol        : Word;

Procedure Menu;
Begin
Clrscr;
GotoXY(0,0);
TextColor(White);
Writeln('                                                        ');
Writeln('[F1]-Ambil Data [F2]-Hasil Pengukuran [F3]-Keluar       ');
Writeln('                                                        ');
End;

Procedure Terima_Karakter;
Begin
     Repeat
        Status := Portw[Line_Status_Reg];
       If (Status And $03) = $03 Then
         Begin
          N := N+1;
          GotoXY(32,20);
          Write('',N,'');
          GotoXY(1,1);
         End;
        Status := Portw[Line_Status_Reg];
      If (Status And $05) = $05 Then
         Begin
          O := O+1;
          GotoXY(39,20);
```

```
          Write('',O,'');
          GotoXY(1,1);
         End;
       Status := Portw[Line_Status_Reg];
      If (Status And $09) = $09 Then
         Begin
          P := P+1;
          GotoXY(46,20);
          Write('',P,'');
          GotoXY(1,1);
         End;
    Until (Status And $01) = $01;
    Isi_Port := Portw[Tx_Buffer];
End;

Procedure Inisialisasi_8250;
Begin
  Portw[Line_Control_Reg] := $80;
  Portw[Baud_Div_Lsb]     := $30;
  Portw[Baud_Div_Msb]     := $00;
  Portw[Line_Control_Reg] := $1F;
End;

Procedure Ambil_data;
Begin
    Inisialisasi_8250;
    GotoXY(10,6);
    Writeln('Data Dikirimkan Dengan Ketentuan :');
    GotoXY(10,7);
    Writeln('- Kecepatan 2400 baud');
    GotoXY(10,8);
    Writeln('- Data Karakter 8 bit');
    GotoXY(10,9);
    Writeln('- 2 Bit Stop');
    GotoXY(10,10);
    Writeln('- Paritas Genap');
    GotoXY(10,11);
    Write('Tekan Tombol "GO" Pada KPT MPF-1');
    Terima_karakter;
    Data_Volt:= ISI_PORT;
    GotoXY(25,13);
    Portw[Modem_Control_Reg] := $00;
End;

Procedure Rangka ;
Begin
GotoXY(27,15);
Writeln('                                        ');GotoXY(27,16);
Writeln('                                        ');GotoXY(27,17);
Writeln('                                        ');GotoXY(27,18);
Writeln('                                        ');GotoXY(27,19);
Writeln('                                        ');GotoXY(27,20);
Writeln('                                        ');GotoXY(27,21);
Writeln('                                        ');GotoXY(27,22);
Writeln('                                        ');GotoXY(1,1);
End;
```

Data Error		
OE	PE	FE

```
Begin
   Periksa :=0;
   Clrscr;
   Textattr := 7;
   Clrscr;
Pilihan :=#0;
Menu;
Data_volt: =00;
Repeat
     If Keypressed Then
        Begin
          Pilihan :=Readkey;
            If Pilihan =#0 Then
               Begin
                  Readln(pilihan);
               End
            Else
               TombolPerluasan: = True;
          Case Pilihan Of
            #59 : Begin
                     Hapusjendela;
                     Menu;
                     GotoXY(2,2);
                     Portw[Line_Status_Reg] := $00;
                     N: =0;O: =0;P: =0;
                     Status:=0;
                     Rangka;
                     Ambil_Data;
                     GotoXY(70,2);
                     GotoXY(30,24);
                     TextColor(White+Blink);
                     Write('Data Telah Diterima');
                  End;
       #60 : Begin
               Hapusjendela;
               Menu;
               BikinJendela('Hasil',33,10,43,15,3,'*',$70,$70);
               Writeln;
               Writeln;
               Write('',Data_Volt,' mVolt');
             End;
       #61 : Begin
                Hapusjendela;
                EXIT
             End;
          End;
     End;
 Until Readkey = #61 ;
Hapusjendela;
End.
```

```
*****************************************************************
Unit ini berfungsi untuk  membuat jendela yang dapat diatur
besarnya.
*****************************************************************

Unit Video;
Interface
Uses Dos,Crt;
Const
   TOTALMEM = 4100; MAKSJEND = 10;
Type
   Datalayar          = Array[1..TOTALMEM Div 2] Of Word;
   Ptrdatalayar       = ^Datalayar;
   TipedataJendela    = Record
                        Ptrisijendela   : PtrDatalayar;
                        Atribaktif      : Byte;
                        Posjendelamin, Posjendelamak   : Word;
                        End;
Var
   NmrJendela      : Byte;
   DataJendela     : Array[0..Maksjend-1] Of Tipedatajendela;

Procedure Simpandatalayar (X1,Y1,X2,Y2 : Byte;
                           Var PtrLayar : PtrDatalayar);
Procedure KembalikanDataLayar (Var PtrLayar :PtrDataLayar);

Procedure Bingkai (Judul                          : String;
                   X1,Y1,X2,Y2,Pilihan            : Byte;
                   Karakter                       : CHAR;
                   Atribut                        : Byte);

Procedure BikinJendela (Judul                     : String;
                        X1,Y1,X2,Y2,Pilihan       : Byte;
                        Karakter                  : CHAR;
                        AtribBingkai,AtribJend    : Byte );

Procedure HapusJendela;
Implementation

Procedure Simpandatalayar (X1,Y1,X2,Y2 : Byte;
                           Var PtrLayar : PtrDatalayar);
Var
  i,j,Indeks,Segmen,Ofset : Word;
Begin
  If LastMode = Mono Then
     Segmen := $B000
  Else Segmen := $B800;
  Ptrlayar^[1] := SWAP (Y1) + X1;
  PtrLayar^[2] := SWAP (Y2) + X2;
  Indeks := 3;
  For i := Y1 to Y2 Do
     Begin
        Ofset := (i-1)*160 + 2*(X1-1);
         For j := X1 to X2 Do
           Begin
```

```
            PtrLayar^[Indeks] := Memw[Segmen:Ofset];
            Inc (Indeks); Inc (Ofset,2);
          End;
      End;
End;

Procedure KembalikanDataLayar (Var PtrLayar :PtrDataLayar);
Var
  i,j,Indeks, segmen, ofset,X1,Y1,X2,Y2 : Word;
Begin
  If Lastmode = Mono Then
     Segmen  := $B000
  Else
     Segmen  := $B800;
  X1 := LO (PtrLayar^[1]); Y1 := HI (PtrLayar^[1]);
  X2 := LO (PtrLayar^[2]); Y2 := HI (PtrLayar^[2]);
  Indeks := 3;
  For i := Y1 To Y2 Do
    Begin
       Ofset := (i-1)*160 + 2*(X1-1);
       For j := X1 To X2 Do
         Begin
            Memw[Segmen:Ofset] := PtrLayar[Indeks];
            Inc (Indeks); Inc(Ofset,2);
         End;
    End;
End;

Procedure Bingkai (Judul                          : String;
                   X1,Y1,X2,Y2,Pilihan            : Byte;
                   Karakter                       : CHAR;
                   Atribut                        : Byte);
Const
   Data : Array [0..8,0..7] of Char
        = ((#000,#000,#000,#000,#000,#000,#000,#000),
           (#218,#191,#192,#217,#179,#179,#196,#196),
           (#213,#184,#212,#190,#179,#179,#205,#205),
           (#214,#183,#211,#189,#186,#186,#196,#196),
           (#201,#187,#200,#188,#186,#186,#205,#205),
           (#220,#220,#223,#223,#221,#222,#220,#223),
           (#176,#176,#176,#176,#176,#176,#176,#176),
           (#177,#177,#177,#177,#177,#177,#177,#177),
           (#178,#178,#178,#178,#178,#178,#178,#178);
Var
  i,Segmen : Word;
Begin
   If (X1<1) OR (X2>80) OR (Y1<1) OR (Y2>25) OR
      ((X2-X1) < 1) OR ((Y2-Y1) < 1) Then
    Exit;
   If (Pilihan < 0) OR (Pilihan > 8) Then
     Pilihan := 1;
   If Pilihan = 0 Then
      For i := 0 to 7 Do
         Data [0,i] := Karakter;
```

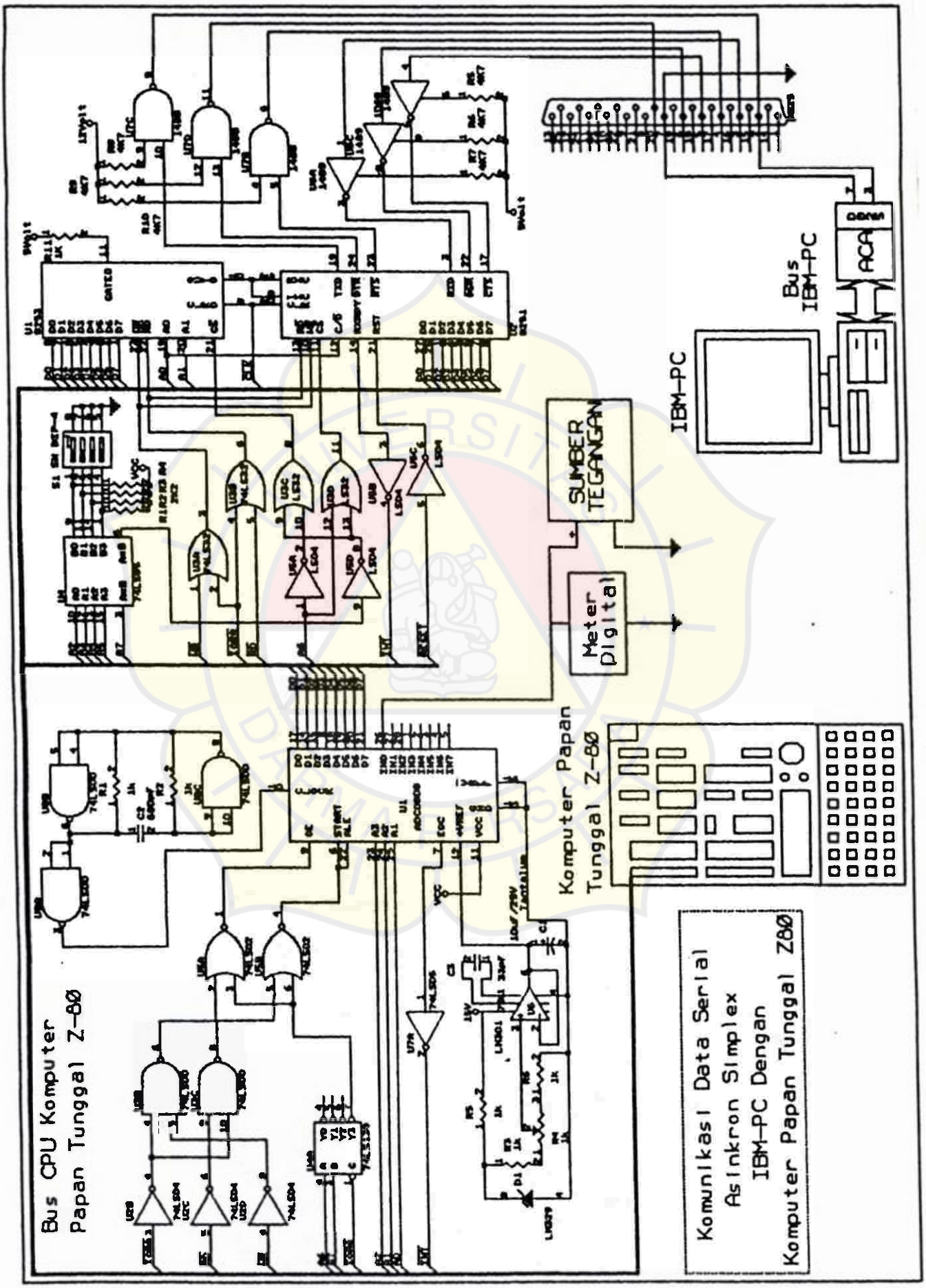
```
    Textattr := Atribut;
    GotoXY (X1,Y1); Write(Data[Pilihan,0]);
    For i := X1+1 To X2-1 Do
        Write(Data[Pilihan,6]);
    GotoXY (X2,Y1); Write(Data[Pilihan,1]);
    For i := Y1+1 To Y2-1 Do
      Begin
       GotoXY (X1, i); Write(Data[Pilihan,4]);
       GotoXY (X2, i); Write(Data[Pilihan,5]);
      End;
    GotoXY (X1,Y2); Write(Data[Pilihan,2]);
    For i := X1+1 To X2-1 Do
        Write(Data[Pilihan,7]);
    If (X2 = 80) AND (Y2 = 25) Then
      Begin
          If LastMode = Mono Then Segmen := $B000
          Else Segmen := $B800;
          MEM[Segmen:3998] := Ord(Data[Pilihan,3]);
          MEM[Segmen:3999] := Textattr
      End
    Else
      Begin
        GotoXY(X2,Y2); Write(Data[Pilihan,3]);
      End;
    If Length(Judul) > (X2-X1+1) Then
       Judul := Copy (Judul,1,X2-X1+1);
    GotoXY (X1+(X2-X1+1-Length(Judul)) Div 2,Y1);
    Write(Judul);
End;

Procedure BikinJendela (Judul                        : String;
                        X1,Y1,X2,Y2,Pilihan          : Byte;
                        Karakter                     : CHAR;
                        AtribBingkai,AtribJend       : Byte );
Begin
  If NmrJendela > (MaksJend-1) Then
     Exit;
  If  (X1<1) OR (X2>80) OR (Y1<1) OR (Y2>25) OR
      ((X2-X1) < 3) OR ((Y2-Y1) < 3) Then
      EXIT;
  WITH dataJendela[NmrJendela] Do
      Begin
        If  MaxAvail >= TotalMEM  Then
            New (PtrIsiJendela)
        Else
            Begin
              Writeln('Memory Tidak Cukup.');
              HALT(1)
            End;
    SimpandataLayar (X1,Y1,X2,Y2,PtrIsiJendela);
    AtribAktif := Textattr;
    PosJendelaMin := WindMin;
    PosJendelaMak := WindMax;
    Window(1,1,80,25);
    Bingkai (Judul,X1,Y1,X2,Y2,Pilihan,Karakter,AtribBingkai);
    Window (X1+1,Y1+1,X2-1,Y2-1);
```

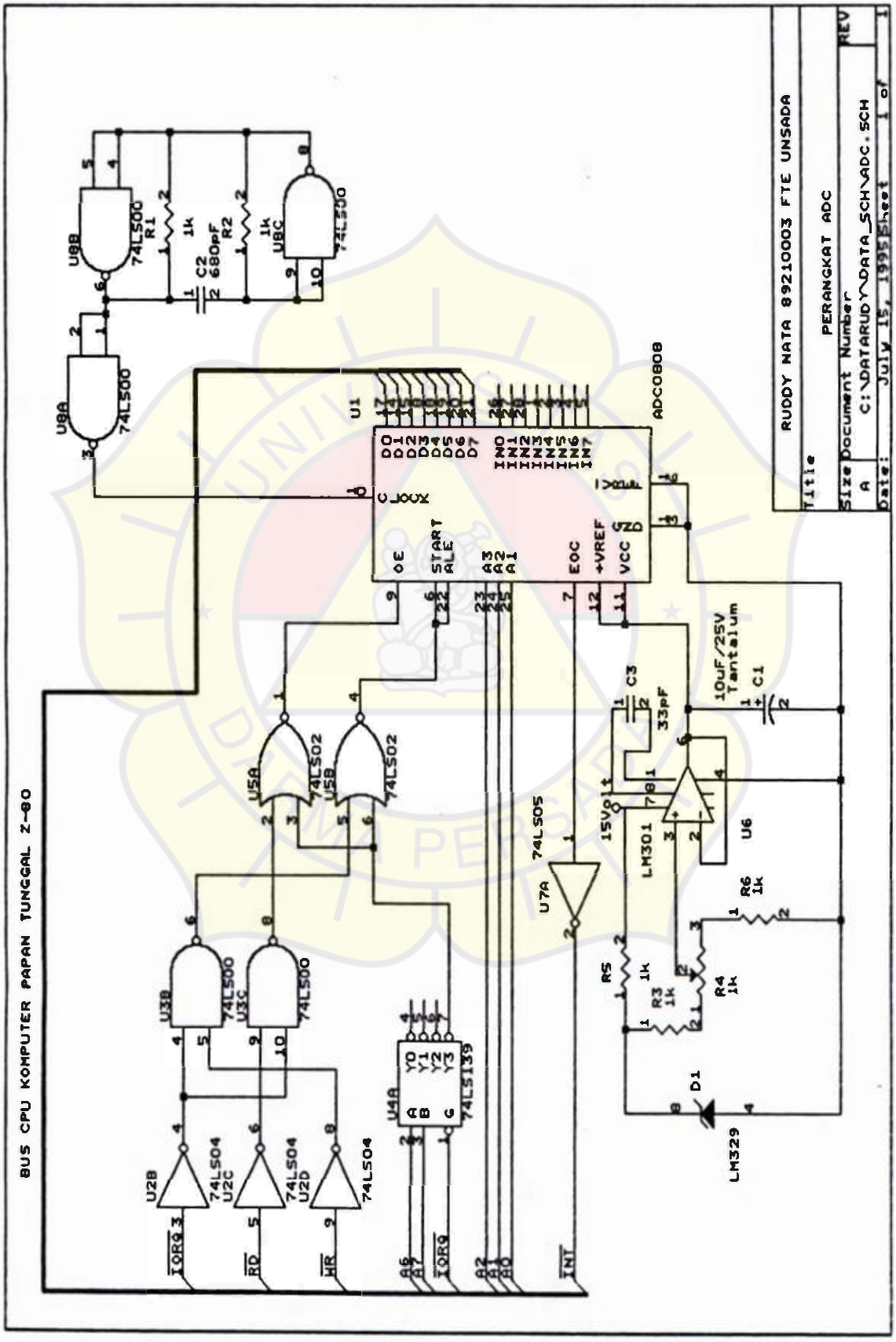
```
    Textattr := AtribJend;
    Clrscr;
    End;
  Inc (NmrJendela);
End;

Procedure HapusJendela;
Begin
  If NmrJendela = 0 Then
     Exit;
  Dec(NmrJendela);
  With DataJendela[NmrJendela] Do
     Begin
       KembalikanDataLayar(PtrIsiJendela);
       Window (Lo(PosJendelaMin)+1,Hi(PosJendelaMin)+1,
               Lo(PosJendelaMak)+1,Hi(PosJendelaMak)+1);
       Textattr := AtribAktif;
       Dispose(PtrIsiJendela);
     End;
End;
Begin
  NmrJendela := 0;
End.
```

LAMPIRAN III : GAMBAR RANGKAIAN SEWAKTU PENGUJIAN SISTEM

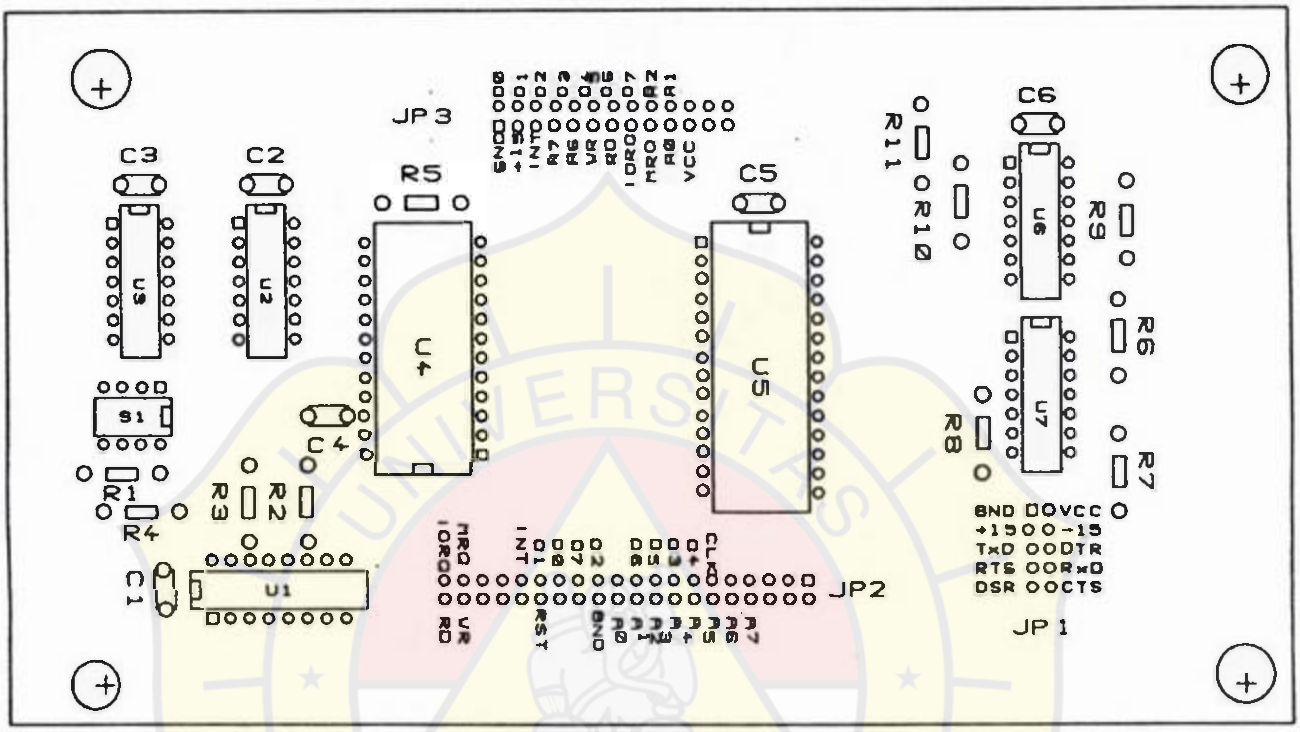


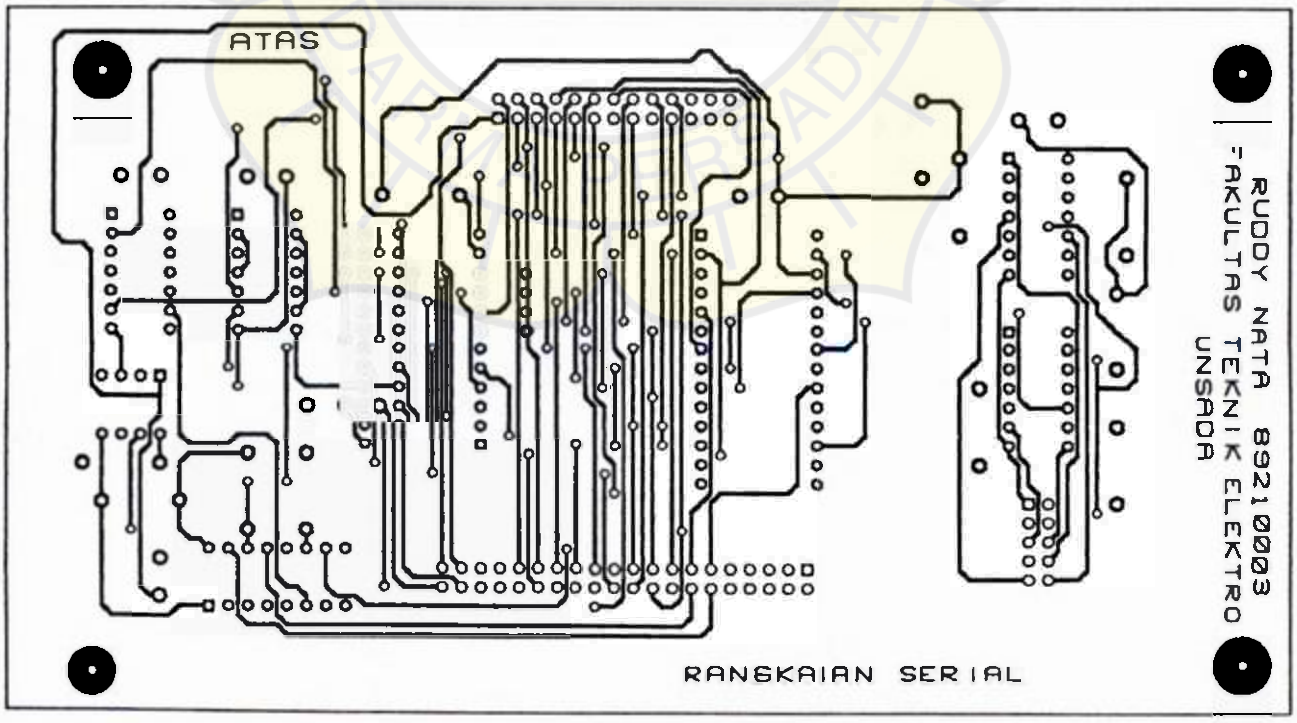
LAMPIRAN IV : GAMBAR RANGKAIAN ADC

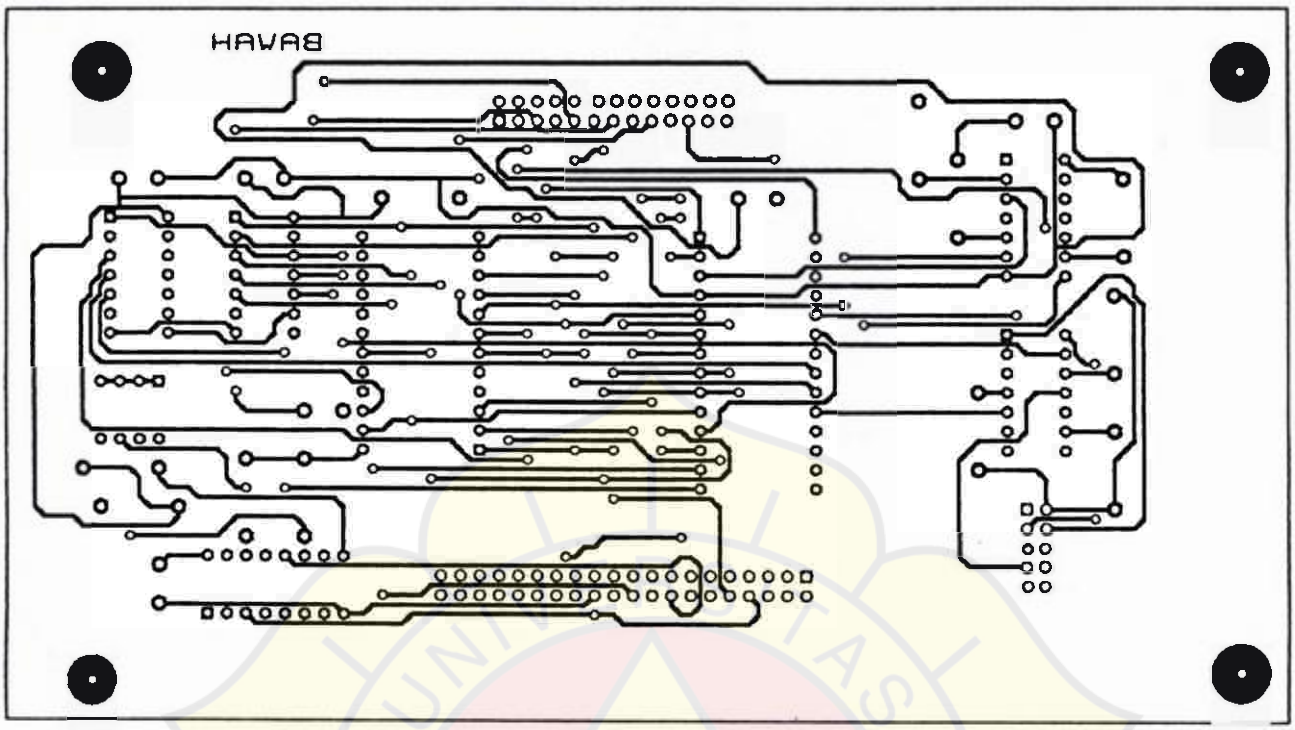


LAMPIRAN V : LAYOUT PCB RANGKAIAN SERIAL DAN ADC

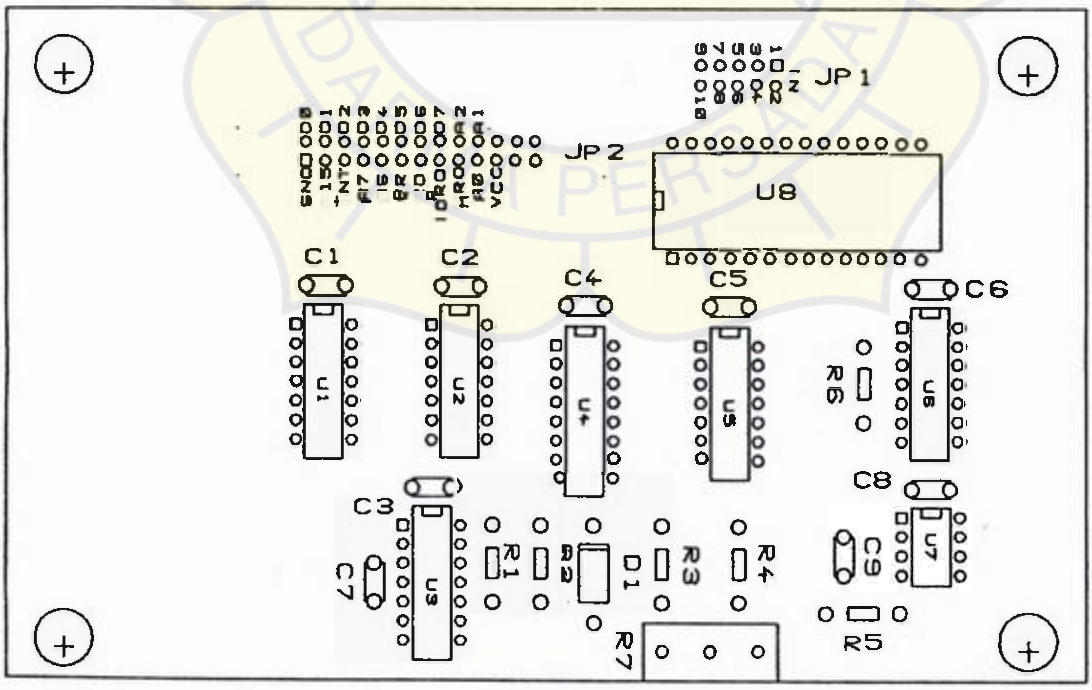
Layout PCB rangkaian serial :

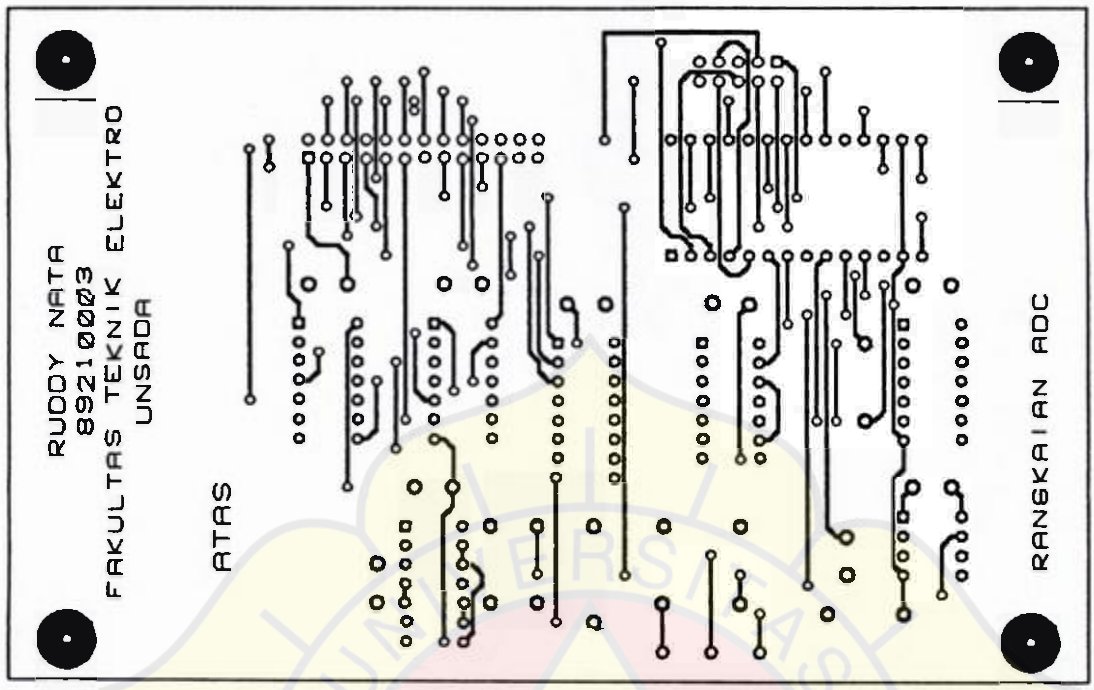


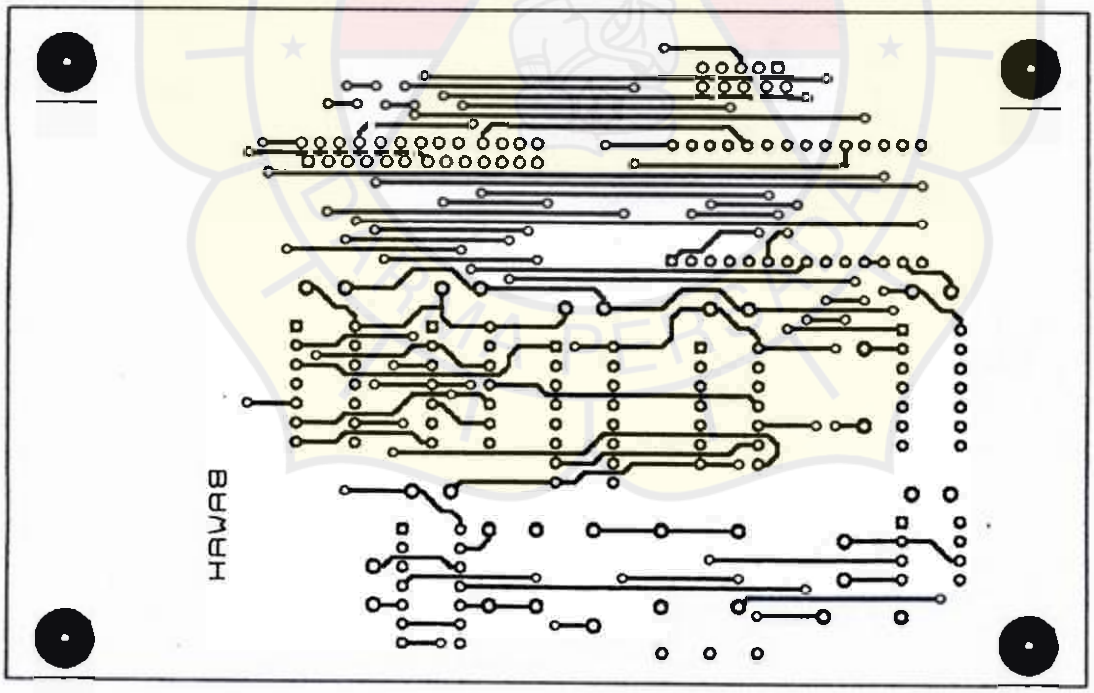




Layout PCB rangkaian ADC :




RUDDY NATA
89210003
FAKULTAS TEKNIK ELEKTRO
UNSADA
ATAS
RANGKAIAN ADC


HAWAB

LAMPIRAN VI : DATA KOMPONEN

ABSOLUTE MAXIMUM RATINGS*

Ambient Temperature Under Bias ..... 0°C to 70°C
Storage Temperature ..... −65°C to +150°C
Voltage On Any Pin
With Respect to Ground ..... −0.5V to +7V
Power Dissipation 1Watt

*NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

D.C. CHARACTERISTICS (T_A = 0°C to 70°C, V_{CC} = 5V ±10%)*

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
V_{IL}	Input Low Voltage	-0.5	0.8	V	
V_{IH}	Input High Voltage	2.2	V_{CC}+.5V	V	
V_{OL}	Output Low Voltage		0.45	V	Note 1
V_{OH}	Output High Voltage	2.4		V	Note 2
I_{IL}	Input Load Current		±10	μA	V_{IN} = V_{CC} to 0V
I_{OFL}	Output Float Leakage		±10	μA	V_{OUT} = V_{CC} to .45V
I_{CC}	V_{CC} Supply Current		140	mA	

CAPACITANCE (T_A = 25°C, V_{CC} = GND = 0V)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{IN}	Input Capacitance			10	pF	fc = 1 MHz
C_{IO}	I/O Capacitance			20	pF	Unmeasured pins returned to V_{SS}

A.C. CHARACTERISTICS (T_A = 0°C to 70°C, V_{CC} = 5.0V ± 10%, GND = 0V)*

Bus Parameters (Note 3)

READ CYCLE

Symbol	Parameter	8253 Min.	8253 Max.	8253-5 Min.	8253-5 Max.	Unit
t_{AR}	Address Stable Before $\overline{READ}$	50		30		ns
t_{RA}	Address Hold Time for $\overline{READ}$	5		5		ns
t_{RR}	$\overline{READ}$ Pulse Width	400		300		ns
t_{RD}	Data Delay From $\overline{READ}$(1)		300		200	ns
t_{DF}	$\overline{READ}$ to Data Floating	25	125	25	100	ns
t_{RV}	Recovery Time Between READ and Any Other Control Signal	1		1		μs

A.C. CHARACTERISTICS (Continued)

WRITE CYCLE

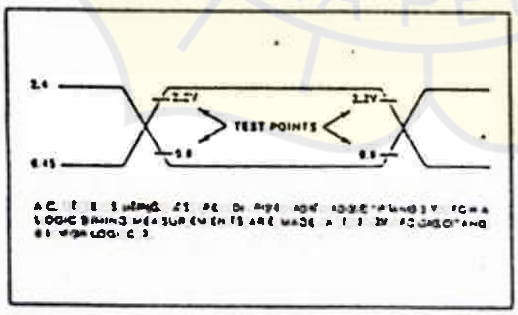
Symbol	Parameter	8253 Min.	8253 Max.	8253-5 Min.	8253-5 Max.	Unit
t_{AW}	Address Stable Before $\overline{WRITE}$	50		30		ns
t_{WA}	Address Hold Time for $\overline{WRITE}$	30		30		ns
t_{WW}	$\overline{WRITE}$ Pulse Width	400		300		ns
t_{DW}	Data Set Up Time for $\overline{WRITE}$	300		250		ns
t_{WD}	Data Hold Time after $\overline{WRITE}$	40		30		ns
t_{RV}	Recovery Time Between $\overline{WRITE}$ and Any Other Control Signal	1		1		μs

CLOCK AND GATE TIMING

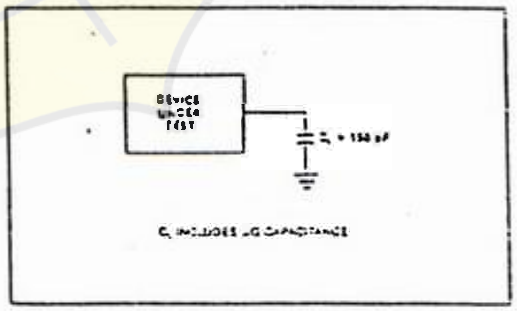
Symbol	Parameter	8253 Min.	8253 Max.	8253-5 Min.	8253-5 Max.	Unit
t_{CLK}	Clock Period	380	dc	380	dc	ns
t_{PWH}	High Pulse Width	230		230		ns
t_{PWL}	Low Pulse Width	150		150		ns
t_{GW}	Gate Width High	150		150		ns
t_{GL}	Gate Width Low	100		100		ns
t_{GS}	Gate Set Up Time to CLK1	100		100		ns
t_{GH}	Gate Hold Time After CLK1	50		50		ns
t_{OD}	Output Delay From CLK1[4]		400		400	ns
t_{ODG}	Output Delay From Gate1 [4]		300		300	ns

NOTES:
1. I_{OL} = 2.2 mA.
2. I_{OH} = −400 μA.
3. AC timings measured at V_{OH} 2.2, V_{OL} = 0.8.
4. C_L = 150pF.
* For Extended Temperature EXPRESS, use M8253 electrical parameters.

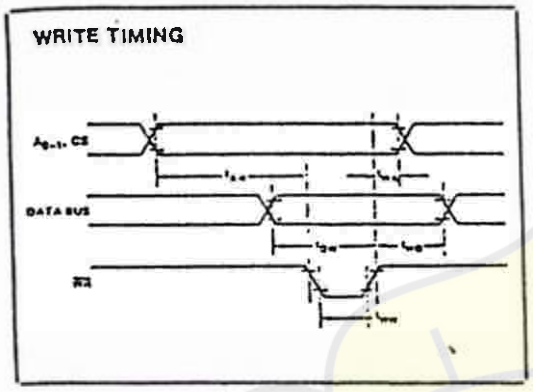
A.C. TESTING INPUT, OUTPUT WAVEFORM

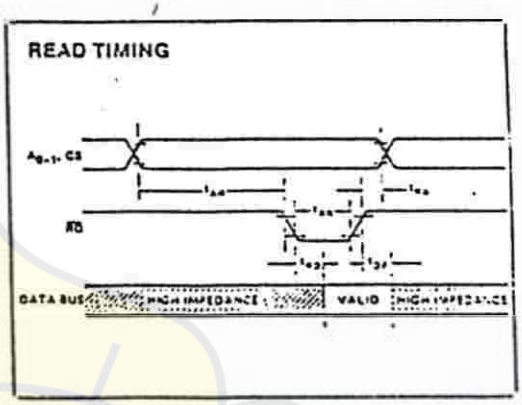


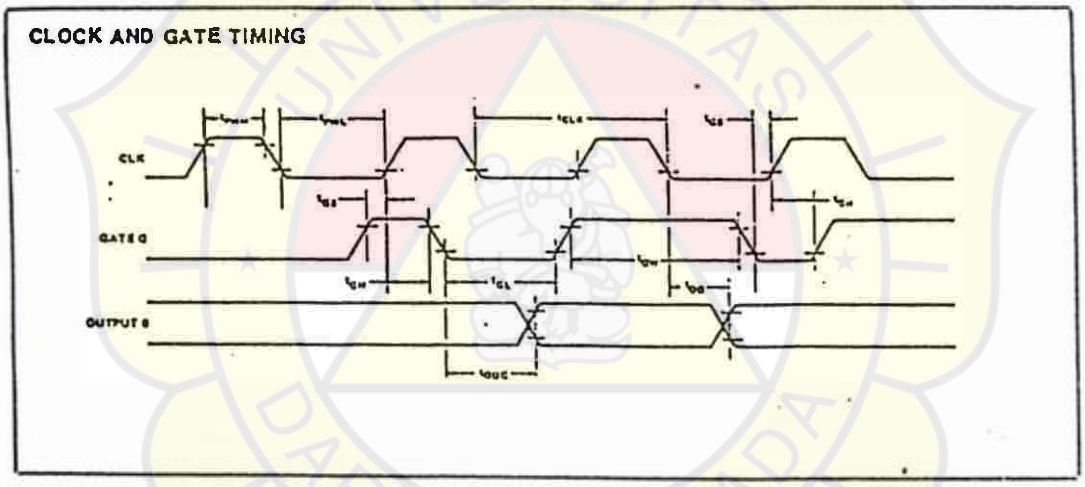
A.C. TESTING LOAD CIRCUIT



WAVEFORMS


WRITE TIMING
DATA BUS


READ TIMING
DATA BUS
HIGH IMPEDANCE
VALID
HIGH IMPEDANCE


CLOCK AND GATE TIMING
CLK
GATE 0
OUTPUT 0

ABSOLUTE MAXIMUM RATINGS*

Ambient Temperature Under Bias .....0°C to 70°C
Storage Temperature .....−65°C to +150°C
Voltage On Any Pin
With Respect To Ground .....−0.5V to −7V
Power Dissipation .....1 Watt

*NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

D.C. CHARACTERISTICS (T_A = 0°C to 70°C, V_{CC} = 5.0V ± 5%, GND = 0V)*

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
V_{IL}	Input Low Voltage	−0.5	0.8	V	
V_{IH}	Input High Voltage	2.0	V_{CC}	V	
V_{OL}	Output Low Voltage		0.45	V	I_{OL} = 2.2 mA
V_{OH}	Output High Voltage	2.4		V	I_{OL} = −400 μA
I_{OFL}	Output Float Leakage		±10	μA	V_{OUT} = V_{CC} TO 0.45V
I_{IL}	Input Leakage		±10	μA	V_{IN} = V_{CC} TO 0.45V
I_{CC}	Power Supply Current		100	mA	All Outputs = High

CAPACITANCE (T_A = 25°C, V_{CC} = GND = 0V)

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
C_{IN}	Input Capacitance		10	pF	fc = 1MHz
$C_{I/O}$	I/O Capacitance		20	pF	Unmeasured pins returned to GND

A.C. CHARACTERISTICS (T_A = 0°C to 70°C, V_{CC} = 5.0V ± 5%, GND = 0V)*

Bus Parameters (Note 1)

READ CYCLE

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
t_{AR}	Address Stable Before $\overline{READ}$ ($\overline{CS}$, $C/\overline{D}$)	0		ns	Note 2
t_{RA}	Address Hold Time for $\overline{READ}$ ($\overline{CS}$, $C/\overline{D}$)	0		ns	Note 2
t_{RR}	$\overline{READ}$ Pulse Width	250		ns	
t_{RD}	Data Delay from $\overline{READ}$		200	ns	3, C_L=150 pF
t_{DF}	$\overline{READ}$ to Data Floating	10	100	ns	

WRITE CYCLE

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
t_{AW}	Address Stable Before $\overline{WRITE}$	0		ns	
t_{WA}	Address Hold Time for $\overline{WRITE}$	0		ns	
t_{WW}	$\overline{WRITE}$ Pulse Width	250		ns	
t_{DW}	Data Set-Up Time for $\overline{WRITE}$	150		ns	
t_{WD}	Data Hold Time for $\overline{WRITE}$	20		ns	
t_{RV}	Recovery Time Between WRITES	6		t_{CY}	Note 4

A.C. CHARACTERISTICS (Continued)

OTHER TIMINGS

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
t_{CY}	Clock Period	320	1350	ns	Notes5,6
t_{ϕ}	Clock High Pulse Width	120	$t_{CY}-90$	ns	
$t_{\bar{\phi}}$	Clock Low Pulse Width	90		ns	
t_R, t_F	Clock Rise and Fall Time		20	ns	
t_{DTx}	TxD Delay from Falling Edge of $\overline{TxC}$		1	µs	
f_{Tx}	Transmitter Input Clock Frequency 1x Baud Rate 16x Baud Rate 64x Baud Rate	 DC DC DC	 64 310 615	 kHz kHz kHz	
t_{TPW}	Transmitter Input Clock Pulse Width 1x Baud Rate 16x and 64x Baud Rate	 12 1		 t_{CY} t_{CY}	
t_{TPD}	Transmitter Input Clock Pulse Delay 1x Baud Rate 16x and 64x Baud Rate	 15 3		 t_{CY} t_{CY}	
f_{Rx}	Receiver Input Clock Frequency 1x Baud Rate 16x Baud Rate 64x Baud Rate	 DC DC DC	 64 310 615	 kHz kHz kHz	
t_{RPW}	Receiver Input Clock Pulse Width 1x Baud Rate 16x and 64x Baud Rate	 12 1		 t_{CY} t_{CY}	
t_{RPD}	Receiver Input Clock Pulse Delay 1x Baud Rate 16x and 64x Baud Rate	 15 3		 t_{CY} t_{CY}	
t_{TxRDY}	TxRDY Pin Delay from Center of Last Bit		14	t_{CY}	Note 7
$t_{TxRDY\ CLEAR}$	TxRDY ↓ from Leading Edge of $\overline{WR}$		400	ns	Note 7
t_{RxRDY}	RxRDY Pin Delay from Center of Last Bit		26	t_{CY}	Note 7
$t_{RxRDY\ CLEAR}$	RxRDY ↓ from Leading Edge of $\overline{RD}$		400	ns	Note 7
t_{IS}	Internal SYNDET Delay from Rising Edge of $\overline{RxC}$		26	t_{CY}	Note 7
t_{ES}	External SYNDET Set-Up Time After Rising Edge of $\overline{RxC}$	$16t_{CY}$	$t_{RPD}-t_{CY}$	ns	Note 7
$t_{TxEMPTY}$	TxEMPTY Delay from Center of Last Bit		20	t_{CY}	Note 7
t_{WC}	Control Delay from Rising Edge of WRITE (TxEn, $\overline{DTR}$, $\overline{RTS}$)		8	t_{CY}	Note 7
t_{CR}	Control to READ Set-Up Time ($\overline{DSR}$, $\overline{CTS}$)	20		t_{CY}	Note 7

*NOTE:

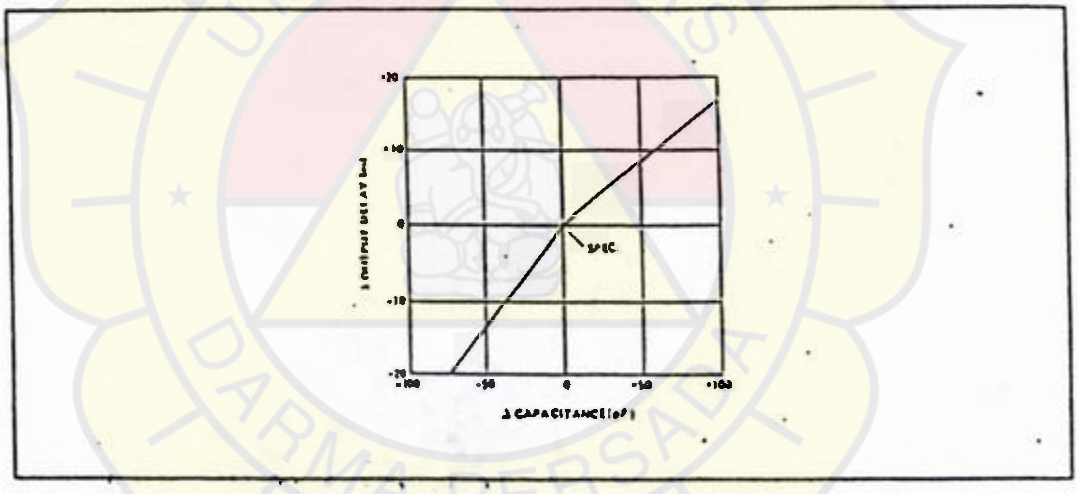
1. For Extended Temperature EXPRESS, use MIL 8251A electrical parameters.

A.C. CHARACTERISTICS (Continued)

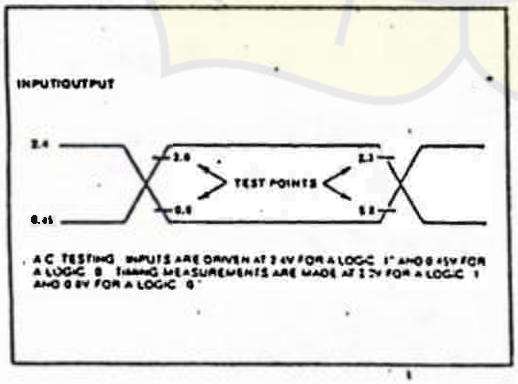
NOTES:

1. AC timings measured V_{OH} = 2.0, V_{OL} = 2.0, V_{OL} = 0.8, and with load circuit of Figure 1.
2. Chip Select (CS) and Command/Data (C/D) are considered as Addresses.
3. Assumes that Address is valid before R_D.
4. This recovery time is for Mode Initialization only. Write Data is allowed only when TxRDY = 1. Recovery Time between Writes for Asynchronous Mode is 8 t_{CY} and for Synchronous Mode is 16 t_{CY}.
5. The TxC and RxC frequencies have the following limitations with respect to CLK: For 1x Baud Rate, f_{Tx} or f_{Rx} ≤ 1/30 t_{CY}):
   For 16x and 64x Baud Rate, f_{Tx} or f_{Rx} ≤ 1/(4.5 t_{CY}).
6. Reset Pulse Width = 6 t_{CY} minimum; System Clock must be running during Reset.
7. Status update can have a maximum delay of 28 clock periods from the event affecting the status.
8. In external sync mode the tes spec. requires the ratio of the system clock (clock) to receive or transmit bit ratios to be greater than 3:1.

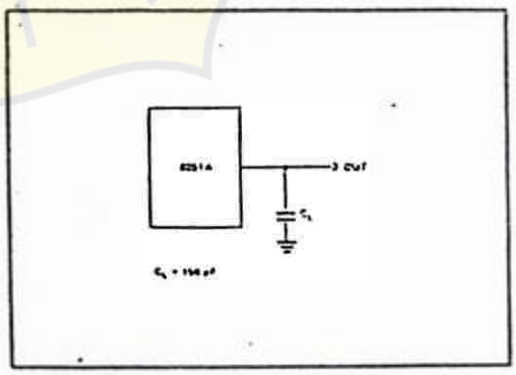
TYPICAL Δ OUTPUT DELAY VS. Δ CAPACITANCE (pF)



A.C. TESTING INPUT, OUTPUT WAVEFORM

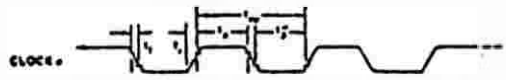


A.C. TESTING LOAD CIRCUIT

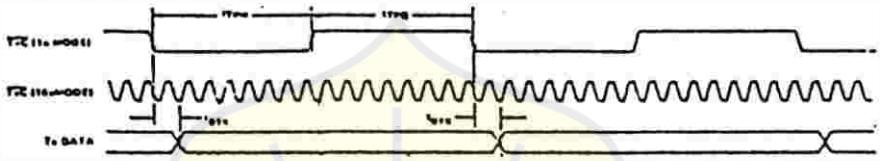


WAVEFORMS

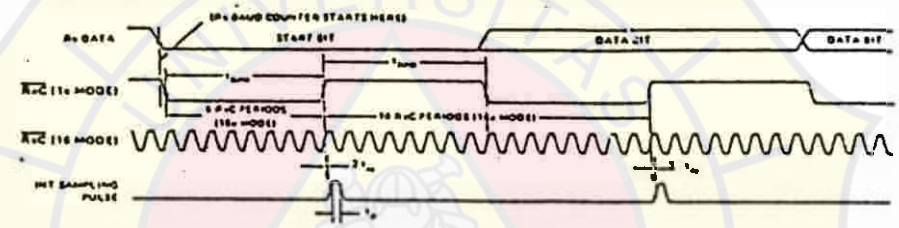
SYSTEM CLOCK INPUT



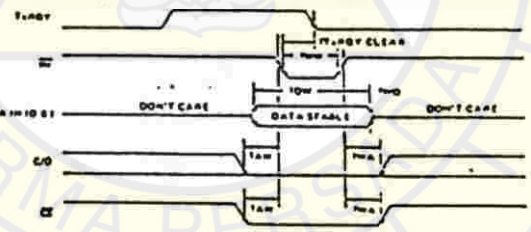
TRANSMITTER CLOCK AND DATA



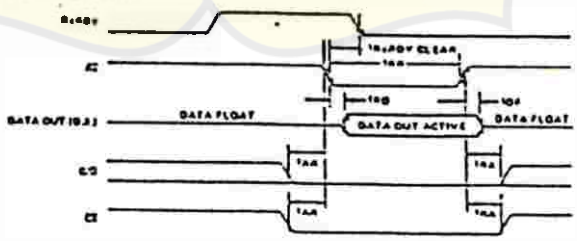
RECEIVER CLOCK AND DATA



WRITE DATA CYCLE (CPU — USART)

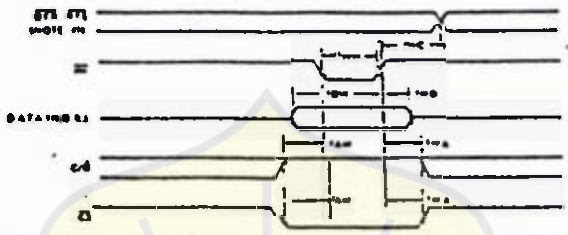


READ DATA CYCLE (CPU —USART)

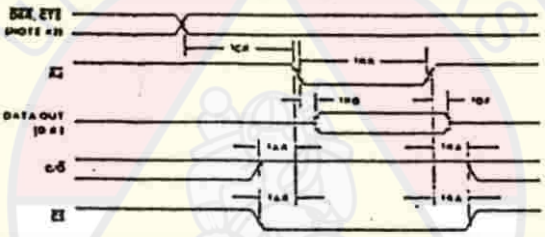


WAVEFORMS (Continued)

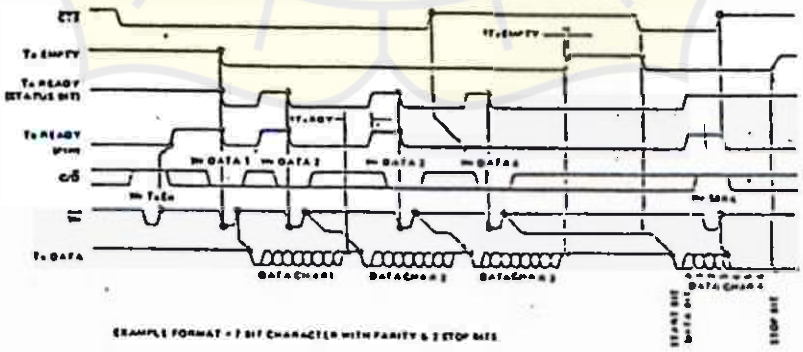
WRITE CONTROL OR OUTPUT PORT CYCLE (CPU — USART)



READ CONTROL OR INPUT PORT (CPU — USART)

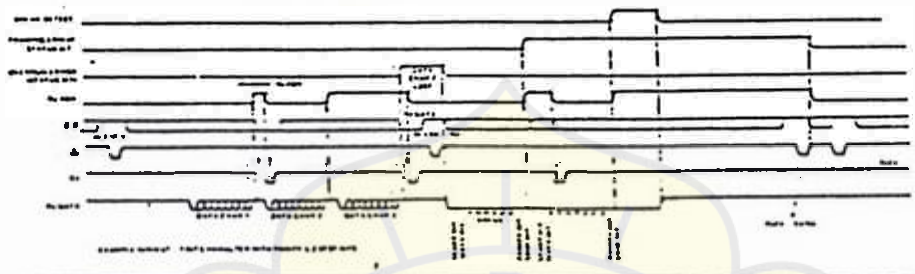


TRANSMITTER CONTROL AND FLAG TIMING (ASYNC MODE)

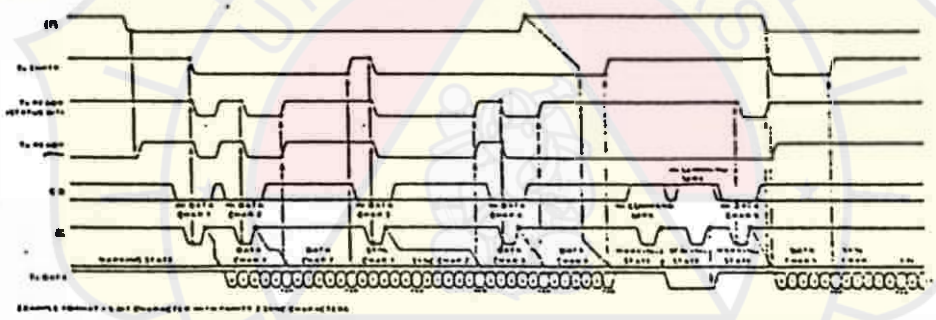


WAVEFORMS (Continued)

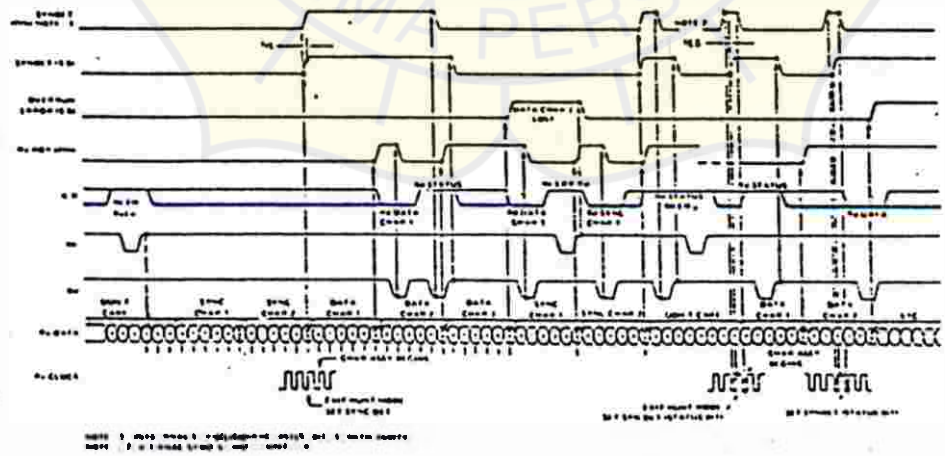
RECEIVER CONTROL AND FLAG TIMING (ASYNC MODE)



TRANSMITTER CONTROL AND FLAG TIMING (SYNC MODE)



RECEIVER CONTROL AND FLAG TIMING (SYNC MODE)



MOTOROLA

MC1488

QUAD LINE DRIVER

The MC 1488 is a monolithic quad single-ended line driver designed to interface data terminal equipment with communications equipment in compliance with the specifications of EIA Standard RS-232C.

Features

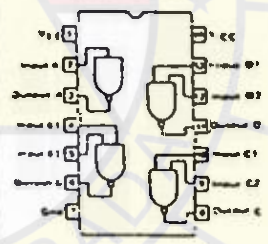
- Current Limited Output
  ±10 mA typ
- Power Off Source Impedance
  300 Ohms min
- Simple Slew Rate Control with a Single External Capacitor
- Flexible Operating Supply Range
- Compatible with Most Popular TTL Logic Families

QUAD MDTL LINE DRIVER
RS-232C
SILICON MONOLITHIC
INTEGRATED CIRCUIT

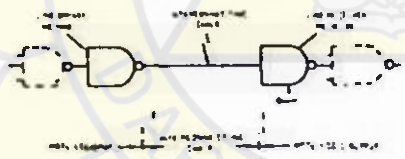
L SUFFIX
CERAMIC PACKAGE
CASE 632
(TO-116)

P SUFFIX
PLASTIC PACKAGE
CASE 646

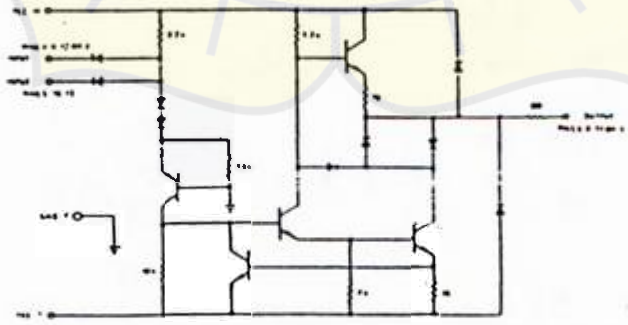
PIN CONNECTIONS



TYPICAL APPLICATION



CIRCUIT SCHEMATIC
(1/4 of the Circuit Shown)



MOTOROLA

MC1488

QUAD LINE DRIVER

The MC1488 is a monolithic quad line driver designed to interface data terminal equipment with data communications equipment in accordance with the specifications of EIA Standard RS-232C.

Features:

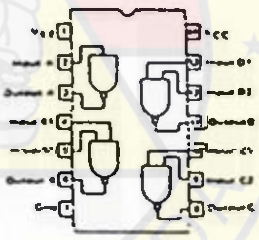
- Current Limited Output
  - 10 mA typ
- Power Off Shunt Impedance
  - 300 Ohms min
- Simple Slew Rate Control with External Capacitor
- Flexible Operating Supply Range
- Compatible with MOTL and MTTL Logic Families

QUAD MOTL LINE DRIVER
RS-232C
SILICON MONOLITHIC
INTEGRATED CIRCUIT

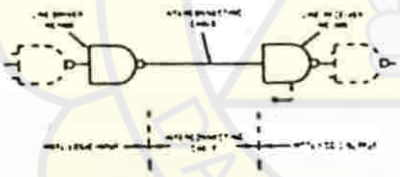
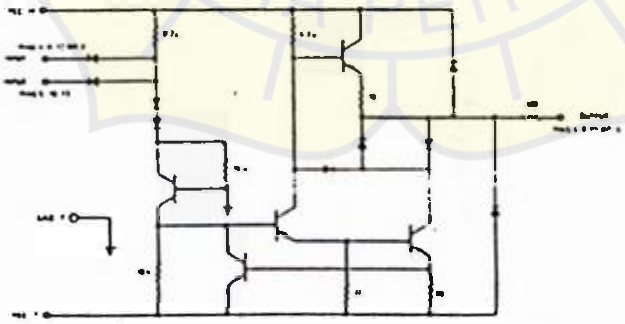
L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116

P SUFFIX
PLASTIC PACKAGE
CASE 646

PIN CONNECTIONS



TYPICAL APPLICATION



CIRCUIT SCHEMATIC
(1/4 of IC is shown)