

## CONTROLLING HYBRID (photovoltaic-wind turbine and diesel engine) POWER PLANT USING ATMEL 8951

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### Hybrid power plant (HPP)?

Figure 1 shows the block diagram of the HPP, comprised of 440 Wp photovoltaic modules, 1 kW wind turbine and 5 kW diesel engine as a back-up. HPP is a centralized PV and wind power generation plant, using battery to store the produced dc current electricity. To cater for emergencies, a conventional diesel generator is also provided. The main component on HPP is the controller, an electronic device which automatically control when the back-up diesel engine shall start assisting with producing electricity.

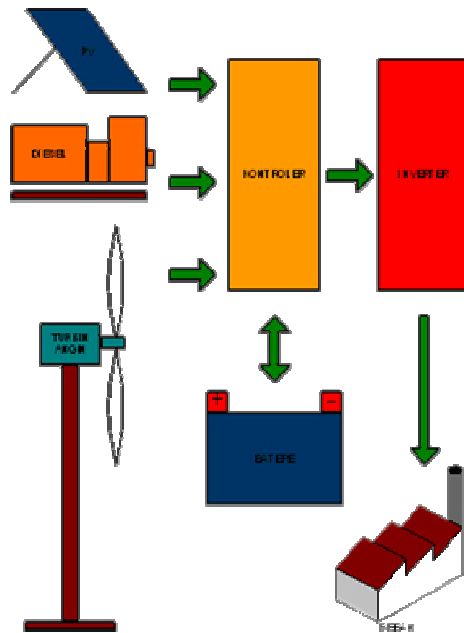


Figure 1. Block Diagram of Hybrid Power Plant



Figure 2. 1 kVA-Hybrid Power Plant

In 2005, I applied Atmel 8951 as a controller to manage the operation of 1 kVA-hybrid power plant. Controller sense the battery bank voltage using voltage divider circuit and the current flow from/to the battery bank using resistor-shunt (50mV/100A). Figure 3 and 4 show the schematic diagram of the HPP and electronic circuit of the controller.

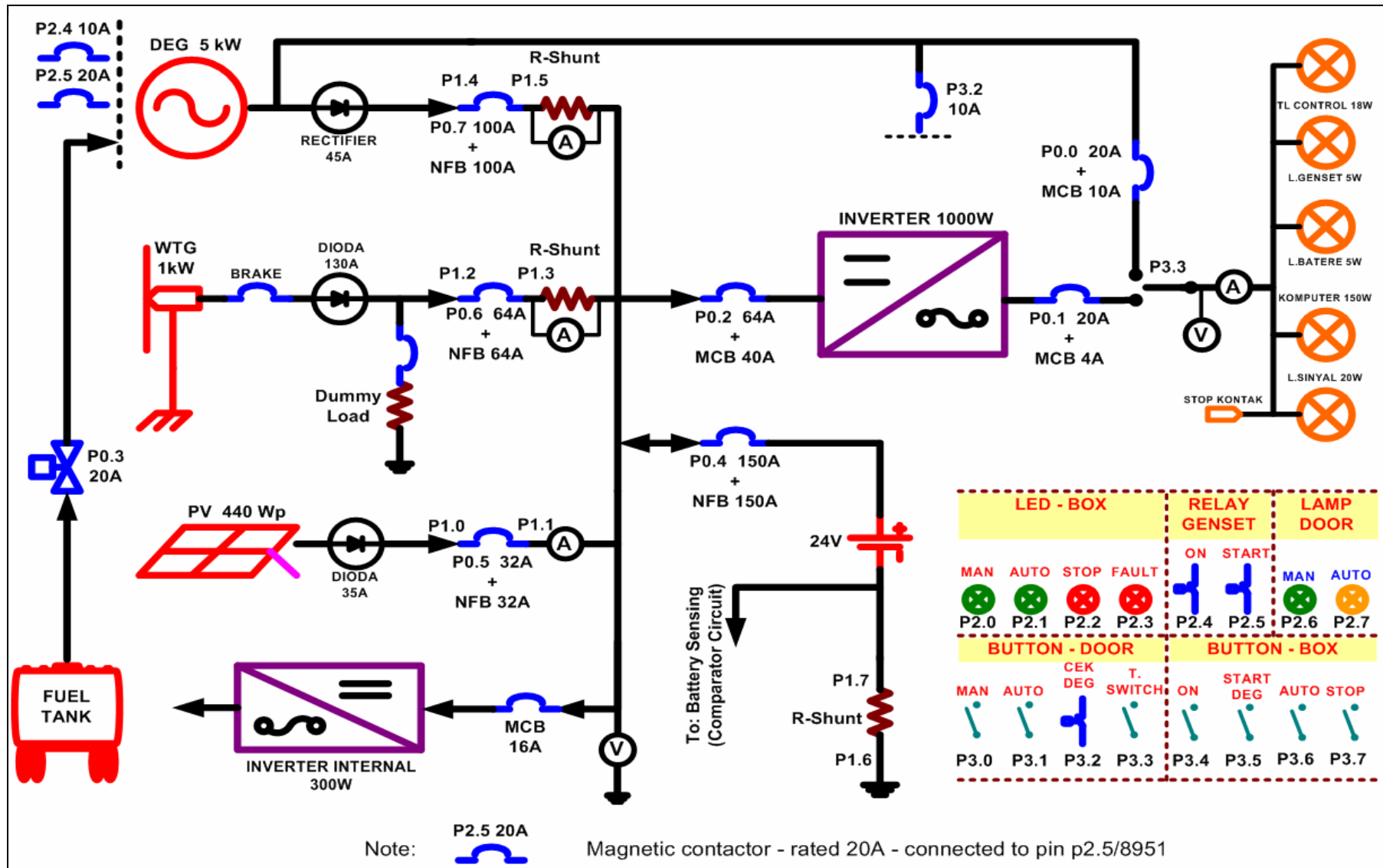


Figure 3. Schematic Diagram of the HPP

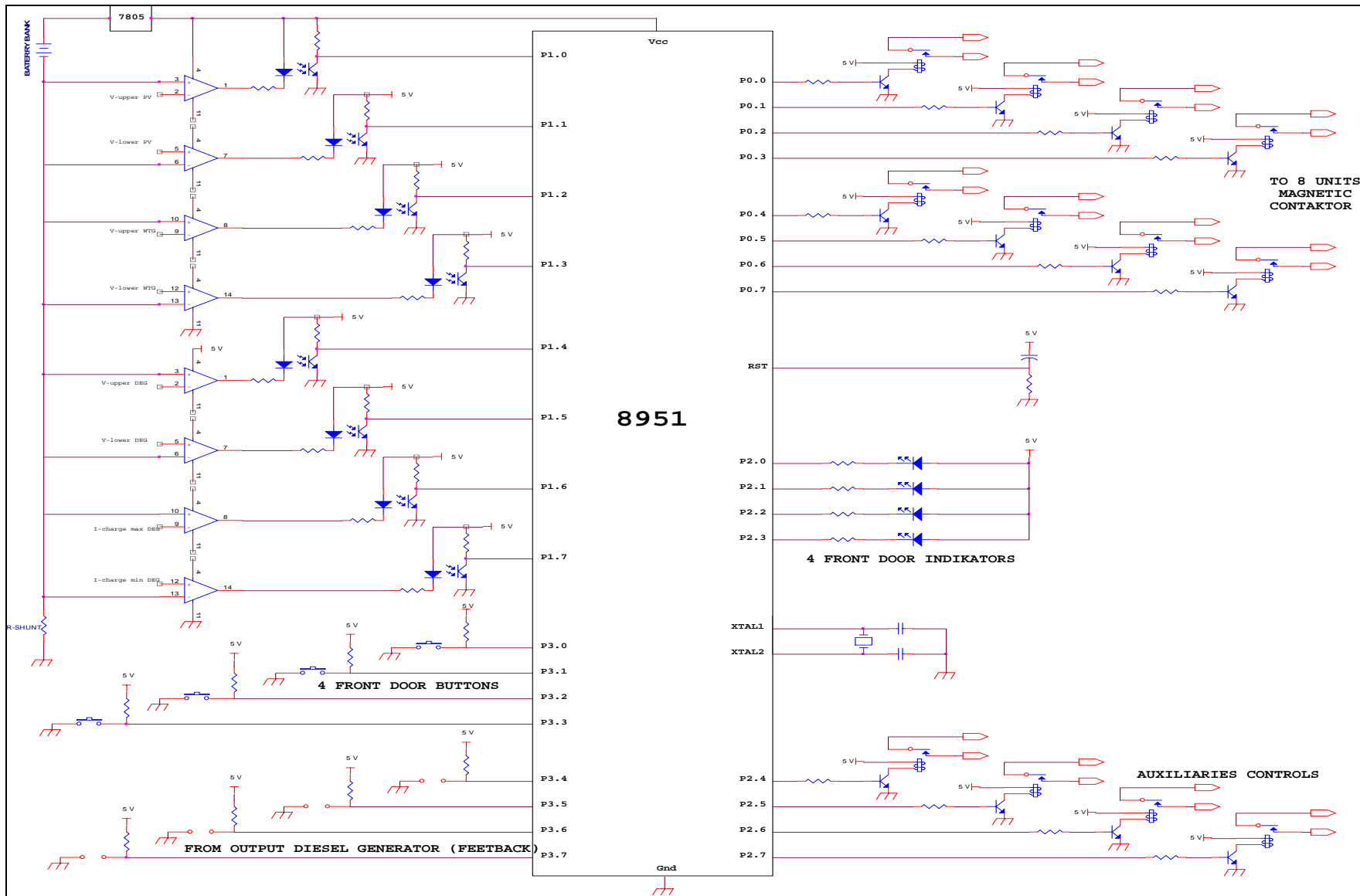


Figure 4. Controller's schematic



Figure 5. Controller

I used mobile-box (2.7m x 1.5m x 1.6m) as a HPP shelter. The box is divided into 3 rooms; battery room, diesel engine room and control room. On the roof, I put a photovoltaic rack (2m X 2m).



Figure 6. The Box (2.7m x 1.5m x 1.6m)



Figure 7. The box is divided into 3 rooms



Figure 8. Control room



Figure 9. Battery room and Diesel room

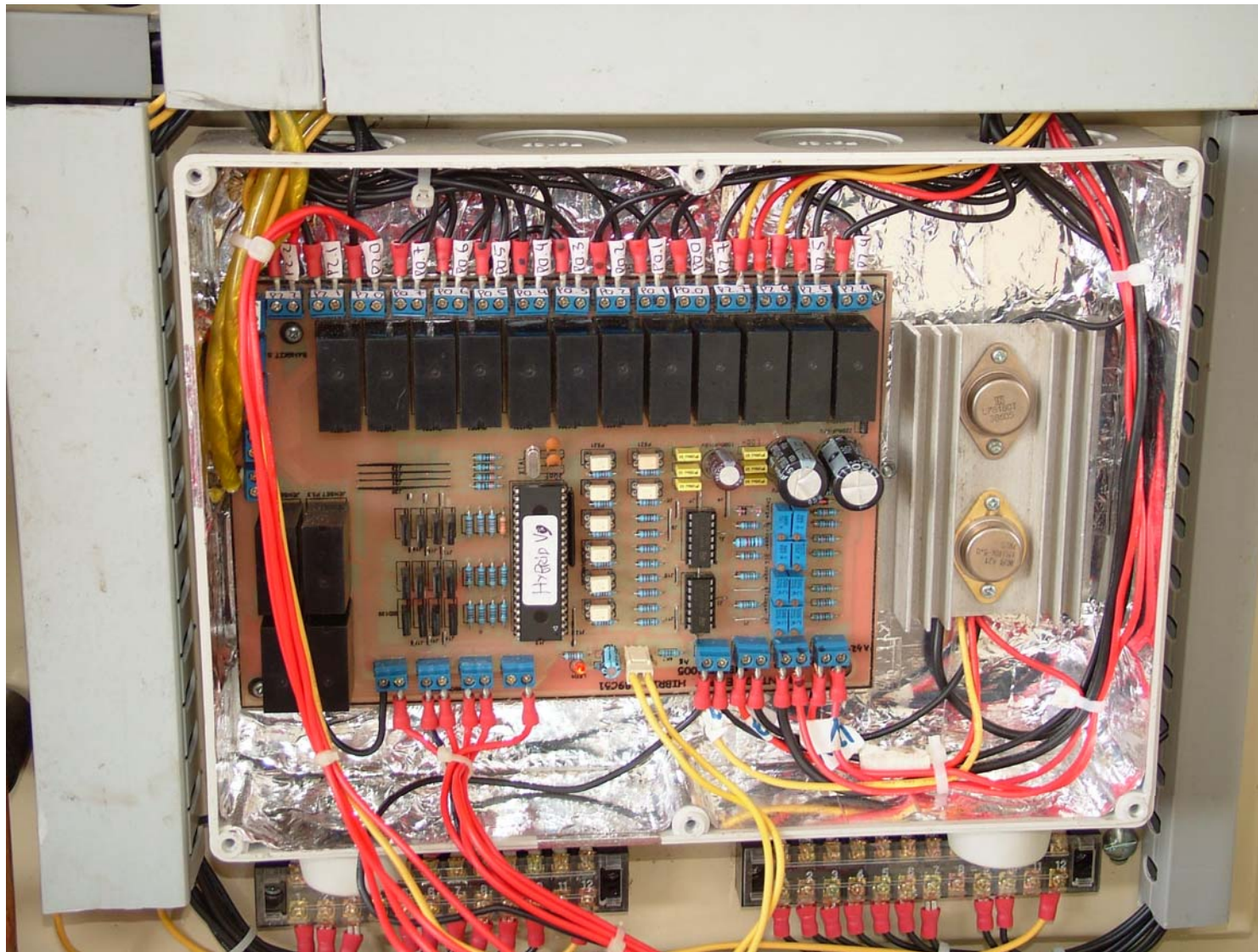


Figure 10. Controller

DOS 5.0 (038-N) MCS-51 MACRO ASSEMBLER, V2.2  
 OBJECT MODULE PLACED IN HYBRIDV4.OBJ  
 ASSEMBLER INVOKED BY: C:\HB2000P\ASM51.EXE HYBRIDV4.ASM

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LOC  OBJ          LINE    SOURCE

1      ;=====
          2      ;
          3      ;   PROGRAM PEMBANGKIT LISTRIK TENAGA HYBRID (PV,WIND,DEG) 1KW DI
BARON, DIY
          4      ;
          5      ;           OLEH: DIDIK ROSTYONO 2005

6      ;=====
          7      ;Blink: 1 blink (double) = menunggu penekanan tombol ON atau
pemilihan mode auto/manual
          8      ;   1 blink (single) = program stop
          9      ;   2 blink = menunggu perubahan transwer switch mode
auto/manual
         10      ;   3 blink = menunggu penekanan tombol genset start atau
auto
         11      ;   4 blink = fault - genset tidak mau start pada mode
auto/manual
         12      ;   5 blink = genset over charge atau hubung singkat pada
mode auto/manual
         13
0000    14      ORG 00H
         15
0000 758000 16      MOV P0,#00H;   MATIKAN SEMUA KONTAKTOR DI PORT 0
0003 75A00F 17      MOV P2,#0FH;   MATIKAN SEMUA KONTAKTOR DI PORT 2
         18
         19      ;SISTEM MENUNGGU PENEKANAN TOMBOL ON DI BOX KONTROLER DIDALAM
PANEL KONTROL

20      ;=====
0006 78FA   21      MULAI:  MOV R0,#250;
0008 A2B4   22      F1:    MOV C,P3.4;
000A D8FC   23      DJNZ R0,F1;
000C 5016   24      JNC START;JIKA TOMBOL ON DITEKAN LOMPAT KE RUTIN START
         25
000E D2A6   26      SETB P2.6;   NYALAKAN LAMPU HIJAU DI PINTU
0010 D2A7   27      SETB P2.7;   NYALAKAN LAMPU KUNING DI PINTU
0012 C2A0   28      CLR P2.0;   NYALAKAN LED HIJAU DI BOX KONTROLER
0014 C2A1   29      CLR P2.1;   NYALAKAN LED HIJAU DI BOX KONTROLER
0016 51AE   30      ACALL DELAI1;  TUNGGU 1 DETIK
0018 C2A6   31      CLR P2.6;   MATIKAN LAMPU HIJAU DI PINTU
001A C2A7   32      CLR P2.7;   MATIKAN LAMPU KUNING DI PINTU
001C D2A0   33      SETB P2.0;   NYALAKAN LED HIJAU DI BOX KONTROLER
001E D2A1   34      SETB P2.1;   NYALAKAN LED HIJAU DI BOX KONTROLER
0020 51AE   35      ACALL DELAI1;  TUNGGU 1 DETIK
         36
0022 80E2   37      SJMP MULAI
         38
         39      ;SISTEM MENUNGGU PENEKANAN TOMBOL MANUAL/AUTO DI PINTU PANEL
KONTROL

40      ;=====
0024 78FA   41      START:  MOV R0,#250;
0026 A2B0   42      F2:    MOV C,P3.0;
0028 D8FC   43      DJNZ R0,F2;
002A 5021   44      JNC MANU;JIKA TOMBOL MAN DITEKAN LOMPAT KE RUTIN MANUAL
         45
002C 78FA   46      MOV R0,#250;
002E A2B1   47      F3:    MOV C,P3.1;
0030 D8FC   48      DJNZ R0,F3;
0032 5016   49      JNC JOTO;JIKA TOMBOL AUTO DITEKAN LOMPAT KE RUTIN AUTO
         50
  
```

LOC	OBJ	LINE	SOURCE
0034	D2A6	51	SETB P2.6;      NYALAKAN LAMPU HIJAU DI PINTU
0036	C2A7	52	CLR P2.7;      MATIKAN LAMPU KUNING DI PINTU
0038	C2A0	53	CLR P2.0;      NYALAKAN LED HIJAU DI BOX KONTROLER
003A	D2A1	54	SETB P2.1;      MATIKAN LED HIJAU DI BOX KONTROLER
003C	51AE	55	ACALL DELAI1;      TUNGGU 1 DETIK
003E	C2A6	56	CLR P2.6;      MATIKAN LAMPU HIJAU DI PINTU
0040	D2A7	57	SETB P2.7;      NYALAKAN LAMPU KUNING DI PINTU
0042	D2A0	58	SETB P2.0;      MATIKAN LED HIJAU DI BOX KONTROLER
0044	C2A1	59	CLR P2.1;      NYALAKAN LED HIJAU DI BOX KONTROLER
0046	51AE	60	ACALL DELAI1;      TUNGGU 1 DETIK
		61	
0048	80DA	62	SJMP START
		63	
004A	02010D	64	JOTO:    LJMP OTO
		65	
		66	;RUTIN MANUAL
		67	;=====
004D	C2A6	68	MANU:    CLR P2.6
004F	C2A7	69	CLR P2.7
0051	D2A0	70	SETB P2.0
0053	D2A1	71	SETB P2.1
0055	D2A6	72	SETB P2.6
0057	D2A0	73	SETB P2.0;
		74	
0059	C2A0	75	BLINK:   CLR P2.0;      BLINK 2X MENUNGGU PERUBAHAN TRANSWER
	SWITCH		
005B	D2A6	76	SETB P2.6
005D	51A1	77	ACALL DELAI
005F	D2A0	78	SETB P2.0
0061	C2A6	79	CLR P2.6
0063	51A1	80	ACALL DELAI
0065	C2A0	81	CLR P2.0
0067	D2A6	82	SETB P2.6
0069	51A1	83	ACALL DELAI
006B	D2A0	84	SETB P2.0
006D	C2A6	85	CLR P2.6
006F	51BB	86	ACALL DELAI2
		87	
0071	20B3E5	88	JB P3.3,BLINK;    CEK TRANSWER SWITCH DI POSISI MANUAL
		89	
0074	C2A0	90	CLR P2.0
0076	D2A6	91	SETB P2.6
		92	
0078	C2A0	93	GSTART: CLR P2.0;      BLINK 3X MENUNGGU PENEKANAN TOMBOL START
	DI BOX		
007A	D2A6	94	SETB P2.6
007C	51A1	95	ACALL DELAI
007E	D2A0	96	SETB P2.0
0080	C2A6	97	CLR P2.6
0082	51A1	98	ACALL DELAI
0084	C2A0	99	CLR P2.0
0086	D2A6	100	SETB P2.6
0088	51A1	101	ACALL DELAI
008A	D2A0	102	SETB P2.0
008C	C2A6	103	CLR P2.6
008E	51A1	104	ACALL DELAI
0090	C2A0	105	CLR P2.0

LOC	OBJ	LINE	SOURCE
0092	D2A6	106	SETB P2.6
0094	51A1	107	ACALL DELAI
0096	D2A0	108	SETB P2.0
0098	C2A6	109	CLR P2.6
009A	51BB	110	ACALL DELAI2
		111	
009C	20B5D9	112	JB P3.5,GSTART; MENUNGGU PENEKANAN TOMBOL START DI BOX
		113	
009F	C2A0	114	CLR P2.0
00A1	D2A6	115	SETB P2.6
		116	
00A3	C287	117	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
00A5	C286	118	CLR P0.6; PUTUSKAN KONTAK WTG
00A7	C285	119	CLR P0.5; PUTUSKAN KONTAK PV
00A9	C284	120	CLR P0.4; PUTUSKAN KONTAK GABUNGAN
00AB	D283	121	SETB P0.3; SAMBUNGAN SOLENOID VALVE
00AD	C282	122	CLR P0.2; PUTUSKAN INPUT INVERTER
00AF	C281	123	CLR P0.1; PUTUSKAN OUTPUT INVERTER
00B1	D2A4	124	SETB P2.4; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
		125	
00B3	7805	126	MOV R0,#5
00B5	51BB	127	ACALL DELAI2; TUNGGU 2 DETIK
		128	
00B7	C280	129	HITUNG1:CLR P0.0; PUTUSKAN BYPASS GENSET
00B9	B80002	130	CJNE R0,#0,PUTAR1;APAKAH GENSET SUDAH GAGAL START 5X
00BC	7143	131	ACALL FAULTM; JIKA SUDAH 5X START GAGAL, LOMPAT KE
	FAULT	132	
00BE	C2A5	133	PUTAR1: CLR P2.5; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
00C0	51D5	134	ACALL DELAI5; TUNGGU 5 DETIK
00C2	D2A5	135	SETB P2.5; PUTAR KUNCI GENSET KE POSISI START
00C4	51C8	136	ACALL DELAI3; TUNGGU 3 DETIK
00C6	C2A5	137	CLR P2.5; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
	KEMBALI		
00C8	51C8	138	ACALL DELAI3;
		139	
00CA	18	140	DEC R0; KURANGKAN R0 DG 1
		141	
00CB	D280	142	SETB P0.0; SAMBUNGAN BYPASS GENSET
00CD	51BB	143	ACALL DELAI2;
		144	
00CF	20B2E5	145	JB P3.2,HITUNG1;
		146	
00D2	C280	147	CLR P0.0; PUTUSKAN BYPASS GENSET
00D4	51E2	148	ACALL DELAIM; PANASKAN GENSET 1 MENIT
		149	
00D6	C2A0	150	CLR P2.0; NYALAKAN LED MAN DI BOX
00D8	D2A6	151	SETB P2.6; NYALAKAN LAMPU MAN DI PINTU
		152	
00DA	C287	153	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
00DC	C286	154	CLR P0.6; PUTUSKAN KONTAK WTG
00DE	C285	155	CLR P0.5; PUTUSKAN KONTAK PV
00E0	C284	156	CLR P0.4; PUTUSKAN KONTAK GABUNGAN
00E2	D283	157	SETB P0.3; SAMBUNGAN SOLENOID VALVE
00E4	C282	158	CLR P0.2; PUTUSKAN INPUT INVERTER
00E6	C281	159	CLR P0.1; PUTUSKAN OUTPUT INVERTER
		160	

LOC	OBJ	LINE	SOURCE
00E8	D280	161	SETB P0.0; SAMBUNGAN BYPASS GENSET
		162	
00EA	7903	163	MOV R1,#3; 3 jam
00EC	7AB4	164	LOOP1: MOV R2,#180; 1 jam
00EE	7BA0	165	LOOP2: MOV R3,#160; 20 detik
00F0	7CFA	166	LOOP3: MOV R4,#250
00F2	7DFA	167	LOOP4: MOV R5,#250
00F4	DDFE	168	LOOP5: DJNZ R5,LOOP5
00F6	30B711	169	JNB P3.7,TOSTOPM;LOMPAT KE TOSTOP JIKA TOMBOL STOP DITEKAN
00F9	DCF7	170	DJNZ R4,LOOP4
00FB	DBF3	171	DJNZ R3,LOOP3
00FD	DAEF	172	DJNZ R2,LOOP2
00FF	D9EB	173	DJNZ R1,LOOP1
		174	
0101	758000	175	MOV P0,#00H; MATIKAN SEMUA KONTAKTOR DI PORT 0
0104	75A00F	176	MOV P2,#0FH; MATIKAN SEMUA KONTAKTOR DI PORT 2
		177	
0107	020024	178	LJMP START; GENSET PANAS, LOMPAT KE START
		179	
010A	0201A1	180	TOSTOPM:LJMP STOPM;
		181	
		182	
		183	;RUTIN AUTO
		184	;=====
010D	C2A6	185	OTO: CLR P2.6
010F	C2A7	186	CLR P2.7
0111	D2A0	187	SETB P2.0
0113	D2A1	188	SETB P2.1
		189	
0115	C2A1	190	BLANK: CLR P2.1; BLINK 2X MENUNGGU PERUBAHAN TRANSWER SWITCH
0117	D2A7	191	SETB P2.7
0119	51A1	192	ACALL DELAI
011B	D2A1	193	SETB P2.1
011D	C2A7	194	CLR P2.7
011F	51A1	195	ACALL DELAI
0121	C2A1	196	CLR P2.1
0123	D2A7	197	SETB P2.7
0125	51A1	198	ACALL DELAI
0127	D2A1	199	SETB P2.1
0129	C2A7	200	CLR P2.7
012B	51BB	201	ACALL DELAI2
		202	
012D	30B3E5	203	JNB P3.3,BLANK;CEK TRANSWER SWITCH DI POSISI AUTO
		204	
0130	D2A1	205	SETB P2.1
0132	C2A7	206	CLR P2.7
		207	
0134	C2A1	208	ASTART: CLR P2.1; BLINK 3X MENUNGGU PENEKANAN TOMBOL AUTO DI BOX
0136	D2A7	209	SETB P2.7
0138	51A1	210	ACALL DELAI
013A	D2A1	211	SETB P2.1
013C	C2A7	212	CLR P2.7
013E	51A1	213	ACALL DELAI
0140	C2A1	214	CLR P2.1

LOC	OBJ	LINE	SOURCE
0142	D2A7	215	SETB P2.7
0144	51A1	216	ACALL DELAI
0146	D2A1	217	SETB P2.1
0148	C2A7	218	CLR P2.7
014A	51A1	219	ACALL DELAI
014C	C2A1	220	CLR P2.1
014E	D2A7	221	SETB P2.7
0150	51A1	222	ACALL DELAI
0152	D2A1	223	SETB P2.1
0154	C2A7	224	CLR P2.7
0156	51BB	225	ACALL DELAI2
		226	
0158	20B6D9	227	JB P3.6,ASTART;MENUNGGU PENEKANAN TOMBOL AUTO DI BOX
		228	
015B	D2A1	229	SETB P2.1
015D	C2A7	230	CLR P2.7
		231	
		232	;PERBANDINGAN V-SIS DENGAN V-REF
		233	;=====
015F	78FA	234	AUTO: MOV R0,#250;
0161	A291	235	F4: MOV C,P1.1;
0163	D8FC	236	DJNZ R0,F4;
0165	5031	237	JNC TONORMIN;LOMPAT KE RUTIN NORMAL MIN > ref
		238	
0167	78FA	239	MOV R0,#250;
0169	A292	240	F5: MOV C,P1.2;
016B	D8FC	241	DJNZ R0,F5;
016D	4064	242	JC NORMAX;LOMPAT KE RUTIN NORMAL MAX > ref
		243	
016F	78FA	244	MOV R0,#250;
0171	A294	245	F6: MOV C,P1.4;
0173	D8FC	246	DJNZ R0,F6;
0175	4076	247	JC MAX;LOMPAT KE RUTIN TEGANGAN MAKSIMUM > ref
		248	
0177	78FA	249	MOV R0,#250;
0179	A295	250	F7: MOV C,P1.5;
017B	D8FC	251	DJNZ R0,F7;
017D	401F	252	JC TOMIN;LOMPAT KE RUTIN TEGANGAN MINIMUM < ref
		253	
017F	30B719	254	JNB P3.7,TOSTOPA;LOMPAT KE TOSTOP JIKA TOMBOL STOP
	DITEKAN		
		255	
0182	C2A1	256	CLR P2.1
0184	D2A7	257	SETB P2.7
		258	
0186	C287	259	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
0188	D286	260	SETB P0.6; SAMBUNGAN KONTAK WTG
018A	D285	261	SETB P0.5; SAMBUNGAN KONTAK PV
018C	D284	262	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
018E	C283	263	CLR P0.3; PUTUSKAN SOLENOID VALVE
0190	D282	264	SETB P0.2; SAMBUNGAN INPUT INVERTER
0192	D281	265	SETB P0.1; SAMBUNGAN OUTPUT INVERTER
0194	C280	266	CLR P0.0; PUTUSKAN BYPASS GENSET
		267	
0196	80C7	268	SJMP AUTO
		269	

LOC	OBJ	LINE	SOURCE
0198	02020F	270	TONORMIN:LJMP NORMIN;
019B	0201BA	271	TOSTOPA:LJMP STOPA
019E	02022C	272	TOMIN: LJMP MIN
		273	
		274	;RUTIN STOP
		275	;=====
01A1	758000	276	STOPM: MOV P0,#00H
01A4	75A00F	277	MOV P2,#0FH
01A7	75A04A	278	LAGEE: MOV P2,#4aH; NYALAKAN LED STOP DI BOX KONTROLER
01AA	51A1	279	ACALL DELAI; TUNGGU 1 DETIK
01AC	75A00F	280	MOV P2,#0FH; MATIKAN LED STOP DI BOX KONTROLER
01AF	51A1	281	ACALL DELAI; TUNGGU 1 DETIK
		282	
01B1	20B4F3	283	JB P3.4,LAGEE; MENUNGGU PENEKANAN TOMBOL ON
		284	
01B4	75A00F	285	MOV P2,#0FH
		286	
01B7	020024	287	LJMP START
		288	
01BA	758000	289	STOPA: MOV P0,#00H
01BD	75A00F	290	MOV P2,#0FH
01C0	75A089	291	LAGE: MOV P2,#89H; NYALAKAN LED STOP DI BOX KONTROLER
01C3	51A1	292	ACALL DELAI; TUNGGU 1 DETIK
01C5	75A00F	293	MOV P2,#0FH; MATIKAN LED STOP DI BOX KONTROLER
01C8	51A1	294	ACALL DELAI; TUNGGU 1 DETIK
		295	
01CA	20B4F3	296	JB P3.4,LAGE; MENUNGGU PENEKANAN TOMBOL ON
		297	
01CD	75A00F	298	MOV P2,#0FH
		299	
01D0	020024	300	LJMP START
		301	
		302	;RUTIN V-SIS NORMAL MAKSIMUM >14V
		303	;=====
01D3	C2A1	304	NORMAX: CLR P2.1
01D5	D2A7	305	SETB P2.7
01D7	C287	306	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
01D9	C286	307	CLR P0.6; PUTUSKAN KONTAK WTG
01DB	D285	308	SETB P0.5; SAMBUNGAN KONTAK PV
01DD	D284	309	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
01DF	C283	310	CLR P0.3; PUTUSKAN SOLENOID VALVE
01E1	D282	311	SETB P0.2; SAMBUNGAN INPUT INVERTER
01E3	D281	312	SETB P0.1; SAMBUNGAN OUTPUT INVERTER
01E5	C280	313	CLR P0.0; PUTUSKAN BYPASS GENSET
		314	
01E7	30B7D0	315	JNB P3.7,STOPA; LOMPAT KE STOP AUTO
		316	
01EA	02015F	317	LJMP AUTO
		318	
		319	;RUTIN V-SIS MAKSIMUM >15V
		320	;=====
01ED	C2A1	321	MAX: CLR P2.1
01EF	D2A7	322	SETB P2.7
01F1	C287	323	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
01F3	C286	324	CLR P0.6; PUTUSKAN KONTAK WTG

LOC	OBJ	LINE	SOURCE
01F5	D284	325	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
01F7	C283	326	CLR P0.3; PUTUSKAN SOLENOID VALVE
01F9	D282	327	SETB P0.2; SAMBUNGAN INPUT INVERTER
01FB	D281	328	SETB P0.1; SAMBUNGAN OUTPUT INVERTER
01FD	C280	329	CLR P0.0; PUTUSKAN BYPASS GENSET
		330	
01FF	30B7B8	331	JNB P3.7,STOPA; LOMPAT KE STOP AUTO
		332	
0202	309005	333	JNB P1.0,PV; LOMPAT KE PV >> ref
		334	
0205	D285	335	SETB P0.5; SAMBUNGAN KONTAK PV
		336	
0207	02015F	337	LJMP AUTO
		338	
020A	C285	339	PV: CLR P0.5
		340	
020C	02015F	341	LJMP AUTO
		342	
		343	;RUTIN V-SIS NORMAL MIN 12V
		344	;=====
020F	C2A1	345	NORMIN: CLR P2.1
0211	D2A7	346	SETB P2.7
0213	C287	347	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
0215	D286	348	SETB P0.6; SAMBUNGAN KONTAK WTG
0217	D285	349	SETB P0.5; SAMBUNGAN KONTAK PV
0219	D284	350	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
021B	C283	351	CLR P0.3; PUTUSKAN SOLENOID VALVE
021D	D282	352	SETB P0.2; SAMBUNGAN INPUT INVERTER
021F	D281	353	SETB P0.1; SAMBUNGAN OUTPUT INVERTER
0221	C280	354	CLR P0.0; PUTUSKAN BYPASS GENSET
		355	
0223	30B794	356	JNB P3.7,STOPA; LOMPAT KE STOP
		357	
0226	02015F	358	LJMP AUTO
		359	
0229	0201BA	360	TOSTOP: LJMP STOPA
		361	
		362	;RUTIN V-SIS MINIMUM 11,6V
		363	;=====
022C	C2A1	364	MIN: CLR P2.1
022E	D2A7	365	SETB P2.7
0230	C287	366	CLR P0.7; PUTUSKAN KONTAK RECTIFIER GENSET
0232	C286	367	CLR P0.6; PUTUSKAN KONTAK WTG
0234	C285	368	CLR P0.5; PUTUSKAN KONTAK PV
0236	D284	369	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
0238	D283	370	SETB P0.3; SAMBUNGAN SOLENOID VALVE
023A	C282	371	CLR P0.2; PUTUSKAN INPUT INVERTER
023C	C281	372	CLR P0.1; PUTUSKAN OUTPUT INVERTER
023E	D2A4	373	SETB P2.4; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
		374	
0240	7805	375	MOV R0,#5
		376	
0242	51BB	377	ACALL DELAI2; TUNGGU 2 DETIK
		378	

LOC	OBJ	LINE	SOURCE
0244	C280	379	HITUNG2:CLR P0.0; PUTUSKAN BYPASS GENSET
0246	B80002	380	CJNE R0,#0,PUTAR2
0249	7170	381	ACALL FAULTA
		382	
024B	C2A5	383	PUTAR2: CLR P2.5; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
024D	51D5	384	ACALL DELAI5; TUNGGU 5 DETIK
024F	D2A5	385	SETB P2.5; PUTAR KUNCI GENSET KE POSISI START
0251	51C8	386	ACALL DELAI3; TUNGGU 3 DETIK
0253	C2A5	387	CLR P2.5; PUTAR KUNCI GENSET KE POSISI ACC(STANDBY)
	KEMBALI		
0255	51C8	388	ACALL DELAI3; BIARKAN TEG OUTPUT GENSET STABIL SELAMA 3
	DETIK		
0257	18	389	DEC R0; KURANGKAN R0
		390	
0258	D280	391	SETB P0.0; SAMBUNGAN BYPASS GENSET UNTUK MENGUJI
	OUTPUT GENSET		
025A	51BB	392	ACALL DELAI2; TUNGGU 2 DETIK
		393	
025C	20B2E5	394	JB P3.2,HITUNG2;CEK TEGANGAN OUTPUT GENSET
		395	
025F	C280	396	CLR P0.0; PUTUSKAN BYPASS GENSET
0261	51E2	397	ACALL DELAIM; PANASKAN GENSET 1 MENIT
		398	
0263	D287	399	SETB P0.7; SAMBUNGAN KONTAK RECTIFIER GENSET
		400	
0265	30962D	401	AW: JNB P1.6,JFS; CEK I-CHARGE MAX
		402	
0268	30B7BE	403	JNB P3.7,TOSTOP;LOMPAT KE TOSTOP JIKA TOMBOL STOP DI BOX
	DITEKAN		
		404	
026B	2091F7	405	JB P1.1,AW; CEK V-SIS > ref
		406	
026E	C2A1	407	CLR P2.1
0270	D2A7	408	SETB P2.7
0272	D287	409	SETB P0.7; SAMBUNGAN KONTAK RECTIFIER GENSET
0274	C286	410	CLR P0.6; PUTUSKAN KONTAK WTG
0276	C285	411	CLR P0.5; PUTUSKAN KONTAK PV
0278	D284	412	SETB P0.4; SAMBUNGAN KONTAK GABUNGAN
027A	D283	413	SETB P0.3; SAMBUNGAN SOLENOID VALVE
027C	D282	414	SETB P0.2; SAMBUNGAN INPUT INVERTER
027E	D281	415	SETB P0.1; SAMBUNGAN OUTPUT INVERTER
0280	C280	416	CLR P0.0; PUTUSKAN BYPASS GENSET
		417	
0282	309610	418	JNB P1.6,JFS; CEK I-CHARGE MAX
		419	
0285	309706	420	JNB P1.7,FULL; CEK I-CHARGE MIN
		421	
0288	30B79E	422	JNB P3.7,TOSTOP;LOMPAT KE TOSTOP JIKA TOMBOL STOP DI BOX
	DITEKAN		
		423	
028B	2094D7	424	JB P1.4,AW; CEK V-SIS > ref
		425	
028E	C283	426	FULL: CLR P0.3; PUTUSKAN SOLENOID VALVE
0290	C2A4	427	CLR P2.4; PUTAR KUNCI GENSET KE POSISI OFF
		428	
0292	02015F	429	LJMP AUTO
		430	
0295	02030C	431	JFS: LJMP FAULTS
		432	
		433	;RUTIN DELAI

LOC	OBJ	LINE	SOURCE
		434	;=====
0298	79FA	435	DELE: MOV R1,#250;
029A	7A14	436	MUT1: MOV R2,#20;
029C	DAFE	437	MUT2: DJNZ R2,MUT2
029E	D9FA	438	DJNZ R1,MUT1
02A0	22	439	RET
		440	
02A1	7902	441	DELAI: MOV R1,#2
02A3	7AFA	442	L11: MOV R2,#250
02A5	7BFA	443	L22: MOV R3,#250
02A7	DBFE	444	L33: DJNZ R3,L33
02A9	DAFA	445	DJNZ R2,L22
02AB	D9F6	446	DJNZ R1,L11
02AD	22	447	RET
		448	
02AE	7908	449	DELAI1: MOV R1,#8
02B0	7AFA	450	L1: MOV R2,#250
02B2	7BFA	451	L2: MOV R3,#250
02B4	DBFE	452	L3: DJNZ R3,L3
02B6	DAFA	453	DJNZ R2,L2
02B8	D9F6	454	DJNZ R1,L1
02BA	22	455	RET
		456	
02BB	7910	457	DELAI2: MOV R1,#16
02BD	7AFA	458	LP1: MOV R2,#250
02BF	7BFA	459	LP2: MOV R3,#250
02C1	DBFE	460	LP3: DJNZ R3,LP3
02C3	DAFA	461	DJNZ R2,LP2
02C5	D9F6	462	DJNZ R1,LP1
02C7	22	463	RET
		464	
02C8	7918	465	DELAI3: MOV R1,#24
02CA	7AFA	466	MUTAR1: MOV R2,#250
02CC	7BFA	467	MUTAR2: MOV R3,#250
02CE	DBFE	468	MUTAR3: DJNZ R3,MUTAR3
02D0	DAFA	469	DJNZ R2,MUTAR2
02D2	D9F6	470	DJNZ R1,MUTAR1
02D4	22	471	RET
		472	
02D5	7928	473	DELAI5: MOV R1,#40
02D7	7AFA	474	LOP1: MOV R2,#250
02D9	7BFA	475	LOP2: MOV R3,#250
02DB	DBFE	476	LOP3: DJNZ R3,LOP3
02DD	DAFA	477	DJNZ R2,LOP2
02DF	D9F6	478	DJNZ R1,LOP1
02E1	22	479	RET
		480	
02E2	793C	481	DELAIM: MOV R1,#60
02E4	7A08	482	LOPO1: MOV R2,#8
02E6	7BFA	483	LOPO2: MOV R3,#250
02E8	7CFA	484	LOPO3: MOV R4,#250
02EA	DCFE	485	LOPO4: DJNZ R4,LOPO4
02EC	DBFA	486	DJNZ R3,LOPO3
02EE	DAF6	487	DJNZ R2,LOPO2
02F0	D9F2	488	DJNZ R1,LOPO1

LOC	OBJ	LINE	SOURCE
02F2	22	489	RET
		490	
02F3	7E18	491	DELAIH: MOV R6,#24
02F5	793C	492	LOOPO1: MOV R1,#60
02F7	7A3C	493	LOOPO2: MOV R2,#60
02F9	7B08	494	LOOPO3: MOV R3,#8
02FB	7CFA	495	LOOPO4: MOV R4,#250
02FD	7DFA	496	LOOPO5: MOV R5,#250
02FF	DEFE	497	LOOPO6: DJNZ R6,LOOPO6
0301	DDFA	498	DJNZ R5,LOOPO5
0303	DCF6	499	DJNZ R4,LOOPO4
0305	DBF2	500	DJNZ R3,LOOPO3
0307	DAEE	501	DJNZ R2,LOOPO2
0309	D9EA	502	DJNZ R1,LOOPO1
030B	22	503	RET
		504	
		505	;RUTIN FAULT
		506	;=====
030C	758000	507	FAULTS: MOV P0,#00H; BLINK 5X
030F	75A085	508	LAGII: MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0312	51A1	509	ACALL DELAI; TUNGGU 1 DETIK
0314	75A00F	510	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0317	51A1	511	ACALL DELAI; TUNGGU 1 DETIK
0319	75A085	512	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
031C	51A1	513	ACALL DELAI; TUNGGU 1 DETIK
031E	75A00F	514	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0321	51A1	515	ACALL DELAI; TUNGGU 1 DETIK
0323	75A085	516	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0326	51A1	517	ACALL DELAI; TUNGGU 1 DETIK
0328	75A00F	518	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
032B	51A1	519	ACALL DELAI; TUNGGU 1 DETIK
032D	75A085	520	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0330	51A1	521	ACALL DELAI; TUNGGU 1 DETIK
0332	75A00F	522	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0335	51A1	523	ACALL DELAI; TUNGGU 1 DETIK
0337	75A085	524	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
033A	51A1	525	ACALL DELAI; TUNGGU 1 DETIK
033C	75A00F	526	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
033F	51BB	527	ACALL DELAI2; TUNGGU 1 DETIK
0341	80CC	528	SJMP LAGII
		529	
0343	758000	530	FAULTM: MOV P0,#00H; BLINK 4X (LED FAULT DAN MAN DI BOX SERTA
LAMPU MAN DI PINTU)			
0346	75A046	531	LAGI: MOV P2,#46H; NYALAKAN LED FAULT DI BOX KONTROLER
0349	51A1	532	ACALL DELAI; TUNGGU 1 DETIK
034B	75A00F	533	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
034E	51A1	534	ACALL DELAI; TUNGGU 1 DETIK
0350	75A046	535	MOV P2,#46H; NYALAKAN LED FAULT DI BOX KONTROLER
0353	51A1	536	ACALL DELAI; TUNGGU 1 DETIK
0355	75A00F	537	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0358	51A1	538	ACALL DELAI; TUNGGU 1 DETIK
035A	75A046	539	MOV P2,#46H; NYALAKAN LED FAULT DI BOX KONTROLER
035D	51A1	540	ACALL DELAI; TUNGGU 1 DETIK
035F	75A00F	541	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0362	51A1	542	ACALL DELAI; TUNGGU 1 DETIK
0364	75A046	543	MOV P2,#46H; NYALAKAN LED FAULT DI BOX KONTROLER

LOC	OBJ	LINE	SOURCE
0367	51A1	544	ACALL DELAI; TUNGGU 1 DETIK
0369	75A00F	545	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
036C	51BB	546	ACALL DELAI2; TUNGGU 1 DETIK
036E	80D6	547	SJMP LAGI
		548	
0370	758000	549	FAULTA: MOV P0,#00H; BLINK 4X (LED FAULT DAN AUTO DI BOX DAN
	LAMPU AUTO DI PINTU)		
0373	75A085	550	LAG: MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0376	51A1	551	ACALL DELAI; TUNGGU 1 DETIK
0378	75A00F	552	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
037B	51A1	553	ACALL DELAI; TUNGGU 1 DETIK
037D	75A085	554	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0380	51A1	555	ACALL DELAI; TUNGGU 1 DETIK
0382	75A00F	556	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0385	51A1	557	ACALL DELAI; TUNGGU 1 DETIK
0387	75A085	558	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
038A	51A1	559	ACALL DELAI; TUNGGU 1 DETIK
038C	75A00F	560	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
038F	51A1	561	ACALL DELAI; TUNGGU 1 DETIK
0391	75A085	562	MOV P2,#85H; NYALAKAN LED FAULT DI BOX KONTROLER
0394	51A1	563	ACALL DELAI; TUNGGU 1 DETIK
0396	75A00F	564	MOV P2,#0FH; MATIKAN LED FAULT DI BOX KONTROLER
0399	51BB	565	ACALL DELAI2; TUNGGU 1 DETIK
039B	80D6	566	SJMP LAG
		567	
		568	END

SYMBOL TABLE LISTING  
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N A M E	T Y P E	V A L U E	A T T R I B U T E S
ASTART . .	C ADDR	0134H	A
AUTO . . .	C ADDR	015FH	A
AW . . . .	C ADDR	0265H	A
BLANK . . .	C ADDR	0115H	A
BLINK . . .	C ADDR	0059H	A
DELAI . . .	C ADDR	02A1H	A
DELAI1 . . .	C ADDR	02AEH	A
DELAI2 . . .	C ADDR	02BBH	A
DELAI3 . . .	C ADDR	02C8H	A
DELAI5 . . .	C ADDR	02D5H	A
DELAIH . . .	C ADDR	02F3H	A
DELAIM . . .	C ADDR	02E2H	A
DELE . . . .	C ADDR	0298H	A
F1 . . . . .	C ADDR	0008H	A
F2 . . . . .	C ADDR	0026H	A
F3 . . . . .	C ADDR	002EH	A
F4 . . . . .	C ADDR	0161H	A
F5 . . . . .	C ADDR	0169H	A
F6 . . . . .	C ADDR	0171H	A
F7 . . . . .	C ADDR	0179H	A
FAULTA . . .	C ADDR	0370H	A
FAULTM . . .	C ADDR	0343H	A
FAULTS . . .	C ADDR	030CH	A
FULL . . . .	C ADDR	028EH	A
GSTART . . .	C ADDR	0078H	A
HITUNG1 . . .	C ADDR	00E7H	A
HITUNG2 . . .	C ADDR	0244H	A
JFS . . . . .	C ADDR	0295H	A
JOTO . . . .	C ADDR	004AH	A
L1 . . . . .	C ADDR	02B0H	A
L11 . . . . .	C ADDR	02A3H	A
L2 . . . . .	C ADDR	02B2H	A
L22 . . . . .	C ADDR	02A5H	A
L3 . . . . .	C ADDR	02B4H	A
L33 . . . . .	C ADDR	02A7H	A
LAG . . . . .	C ADDR	0373H	A
LAGE . . . .	C ADDR	01C0H	A
LAGEE . . . .	C ADDR	01A7H	A
LAGI . . . .	C ADDR	0346H	A
LAGII . . . .	C ADDR	030FH	A
LOOP1 . . . .	C ADDR	00ECH	A
LOOP2 . . . .	C ADDR	00EEH	A
LOOP3 . . . .	C ADDR	00F0H	A
LOOP4 . . . .	C ADDR	00F2H	A
LOOP5 . . . .	C ADDR	00F4H	A
LOOP01 . . . .	C ADDR	02F5H	A
LOOP02 . . . .	C ADDR	02F7H	A
LOOP03 . . . .	C ADDR	02F9H	A
LOOP04 . . . .	C ADDR	02FBH	A
LOOP05 . . . .	C ADDR	02FDH	A
LOOP06 . . . .	C ADDR	02FFH	A

N A M E	T Y P E	V A L U E	A T T R I B U T E S
LOP1 . . .	C ADDR	02D7H	A
LOP2 . . .	C ADDR	02D9H	A
LOP3 . . .	C ADDR	02DBH	A
LOPO1 . . .	C ADDR	02E4H	A
LOPO2 . . .	C ADDR	02E6H	A
LOPO3 . . .	C ADDR	02E8H	A
LOPO4 . . .	C ADDR	02EAH	A
LP1 . . .	C ADDR	02BDH	A
LP2 . . .	C ADDR	02BFH	A
LP3 . . .	C ADDR	02C1H	A
MANU . . .	C ADDR	004DH	A
MAX . . .	C ADDR	01EDH	A
MIN . . .	C ADDR	022CH	A
MULAI . . .	C ADDR	0006H	A
MUT1 . . .	C ADDR	029AH	A
MUT2 . . .	C ADDR	029CH	A
MUTAR1 . . .	C ADDR	02CAH	A
MUTAR2 . . .	C ADDR	02CCH	A
MUTAR3 . . .	C ADDR	02CEH	A
NORMAX . . .	C ADDR	01D3H	A
NORMIN . . .	C ADDR	020FH	A
OTO . . .	C ADDR	010DH	A
P0 . . .	D ADDR	0080H	A
P1 . . .	D ADDR	0090H	A
P2 . . .	D ADDR	00A0H	A
P3 . . .	D ADDR	00B0H	A
PUTAR1 . . .	C ADDR	00BEH	A
PUTAR2 . . .	C ADDR	024BH	A
PV . . .	C ADDR	020AH	A
START . . .	C ADDR	0024H	A
STOPA . . .	C ADDR	01BAH	A
STOPM . . .	C ADDR	01A1H	A
TOMIN . . .	C ADDR	019EH	A
TONORMIN . . .	C ADDR	0198H	A
TOSTOP . . .	C ADDR	0229H	A
TOSTOPA . . .	C ADDR	019BH	A
TOSTOPM . . .	C ADDR	010AH	A

REGISTER BANK(S) USED: 0

ASSEMBLY COMPLETE, NO ERRORS FOUND