AUTOMATION IN THE FIELD OF UNDERGROUND CAR PARKING SYSTEM

TANMAY SINHA ROY

Corresponding author, Assistant Professor, Dept. of ICE, Haldia Institute of Technology, Haldia-721657, WB, India, Email: tanmoysinha.roy@rediffmail.com

ABHIJIT BHAGAT

Assistant Professor, Dept. of AEIE, Techno India College of Technology, kolkata-700156, WB, India

ABSTRACT : The proposed work is based on designing an Automatic Underground Car Parking using automation. Designing this car parking in a proper way will save a large amount of space, money and power. As this car parking is designed for underground module, so no space is required for parking on ground. In the proposed work sole concentration has been given on the logic to develop the swapping of plates for CAR IN and CAR OUT purpose. Here, Programmable Logic Controller (PLC) is used as the automation tool.

When any car has to be parked the operator or customer check the status of each plate that is any plate is empty or not according to indicator ON/OFF. If indicator is ON signifies that plate have already car and OFF signifies that plate is empty. And hence for CAR IN, operator selects any empty plate through toggle switch of PLC and gives CAR IN signal through push button and according to selection of plate that empty plate comes at the counter or receiving end and car will be placed at the plate and then plate again goes to its initial position. Similarly for CAR OUT, operator selects the desired plate through toggle switch of PLC and gives CAR OUT signal through push button and according to selection of plate that plate comes at the counter or receiving end and car will be handed over to customer and then plate again goes to its initial position. The good aspect of this project is by this technique we can minimize the space for car parking in a large extent.

KEYWORDS: Automation, PLC, toggle switch, push button

INTRODUCTION

The automatic system of car parking is designed with the help of PLC (GE FANUC) and interfacing computer. Here the program i.e. ladder logic will be fed into the PLC through computer.

Here (3×3) matrix (which can be varied up to (n×n) matrix) is considered for design in which 7 number of plates are for placing the car on plate and remaining two are vacant position, in which one is lift position and another for the purpose of swapping.

In this type of design, a square matrix of odd like (3×3, 5×5) is considered and one middle position of which is vacant for lift (say 9 no.) and one position in each square is vacant say (3) for the purpose of swapping.

Here (3×3) matrix is considered for the purpose of design as per limitation of sources available. In which 7 numbers of slots are having the plate for car placing, one position is used for the lift and one is left out for the purpose of swapping.

Here the slots having the plates are identified by numbers, plate 1, plate 2, plate 4, plate 5, plate 6, plate 7, plate 8 and slot 3 is vacant position and slot 9 is used for lift.

At first the operator gives the signal to PLC either car IN/ car OUT and selecting

one plate say no. 7, then plate 4 is shifted to vacant position 3, plate 5 is shifted to 4 position, plate 6 is shifted to 5 position and then 7 no. plate is shifted to 6 position and then to 9 position (say lift position), and lift move up the plate at the counter and from which according to car IN/ CAR OUT signal it receive the car or handover the car to customer. After car IN or car OUT from the plate the lift will again activated and plate moves down and again it will shifted to position 6 and then position 7 and other plates also moves back into their home position.

When any car has to be parked the operator or customer check the status of each plate that is any plate is empty or not according to indicator ON/OFF. If indicator is ON means that plate have already car and OFF means plate is empty.

And operator selects any empty plate through toggle switch of PLC and gives CAR IN signal through push button and according to selection of plate that empty plate is come at the counter or receiving end and car is placed at the plate. Here information about the car is recorded in the computer as follows:-

NAME OF CAR OWNER:-

CAR NO.:-

CAR WEIGHT:-

PLATE NO. ON WHICH CAR PLACED:-

And corresponding to that a slip is generated for the customer which he/she will be submitting when the car is handover to them. Here for the testing of the project, LED has been considered in place of car and status of LED shows the availability of car i.e. LED ON means there is car on the plate, OFF means no car on the plate. Hence by single LED we show three different states:-

LED ON: - Indication is that car available on the plate.

LED OFF: - Indication is that there is no car on the plate, i.e. Plate is vacant.

LED BLINKING: - Indication is that the plate Selected for CAR IN/ CAR OUT operation.

Now each plate has a LED, which shows the above three states of plate. And position 3, which is empty, i.e. no plate at that slot for easy of swapping, have two LED one shows the slot is empty, LED ON when any plate comes to this position and LED OFF when no plate is available on this position, and another LED shows the status of availability of car on the plate which come from position 2 or position 3.

Here total number of plate are 7, hence there are 7 inputs used for selecting the 7 different plates. And corresponding to that 10 output is used. For the selection of plate here, toggle switch is used. And for selecting a plate we put the toggle switch in ON mode and after the parking operation (in/ out) is complete we put the toggle switch in OFF mode. For 7 different plates, I am using 7 different input as below:-

PLATE 1:- input I_1

PLATE 2:- input I_2

PLATE 4:- input I_4

PLATE 5:- input I_5

PLATE 6:- input I_6

PLATE 7:- input I_3

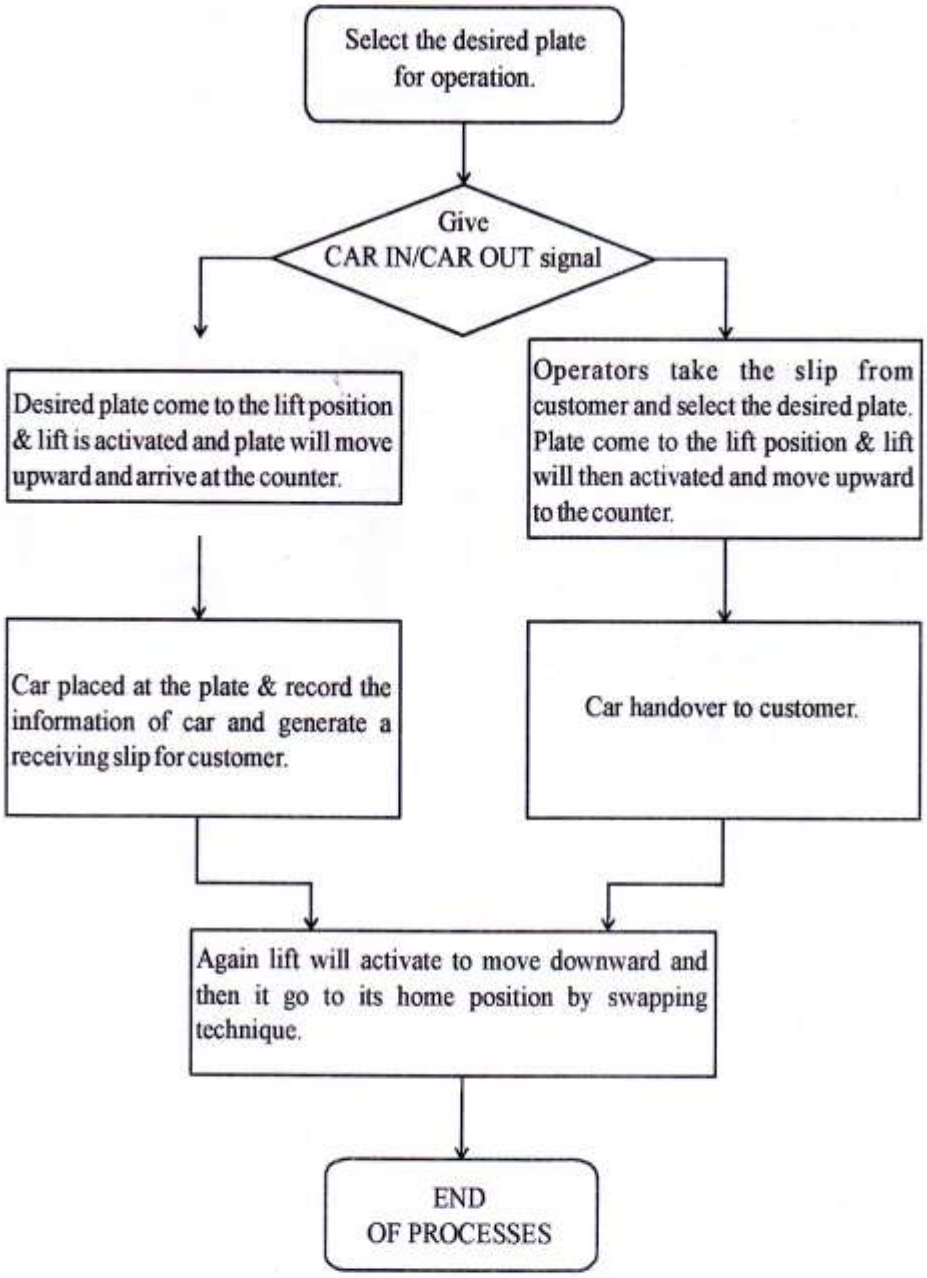
PLATE 8:- input I_7

Beside these 7 inputs, 2 other inputs I_8 and I_{10} are also used,

Input I_8 :- CAR IN input.

Input I_{10}:- CAR OUT input.

FLOW CHART (Description of the process)

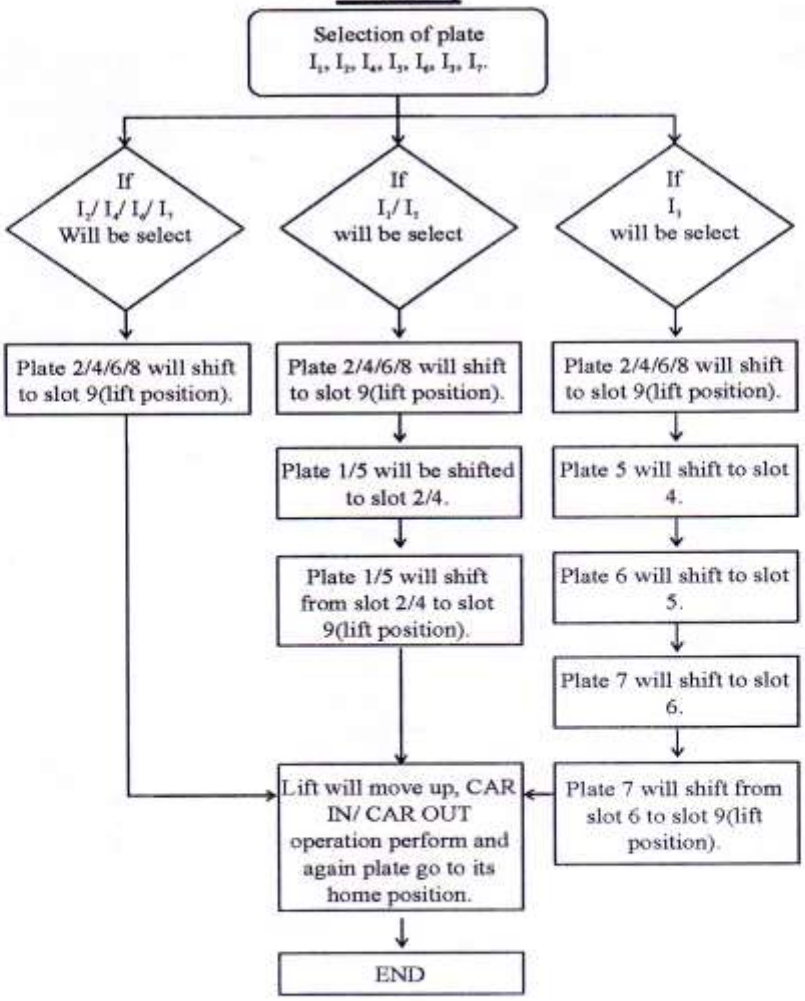


POSITION OF PLATE

PLATE 1	PLATE 2	POS. 3 (VACANT)
PLATE 8	POS. 9 (LIFT POS)	PLATE 4
PLATE 7	PLATE 6	PLATE 5

Fig : 1

FLOWCHART (SHOWING THE PATH FOLLOWED BY EACH PLATE)



RESULTS AND DISCUSSIONS

Ladder programming has been used to implement the automation system for underground parking. Different ladders will perform different operations. So we have considered different ladders for different operation of plates. Ladder1 to 7 are used for taking inputs from 7 plates and storing them in memory. Execution of plates 1,2,4,5 is done by ladder 8-11 and ladder 20-36.Execution of plate 6 and plate 8 is done by ladder 12, 16,17,18,19 and ladder 37-47. Execution of plate 7 is done by ladder 69-90. Ladder 13, 14 and 15 are used for blinking of LEDs by Timers and thus showing the status of the time-period during which the operation has been performed.

Output operation for each plate has been implemented using the conditions of LEDs. In place of cars, LEDs have been considered. The different operations of output are given by ladder 48-54 and ladder 56-68.

The different operations and descriptions for each plate has been given below with their register names, references, variable names, reference description and block instrument rung condition.

MSIT VERSAPRO

Imput (%) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%100001	%100001	i/p of plate 1	_MAIN NOCON 1
%100002	%100002	i/p of plate 2	_MAIN NOCON 2
%100003	%100003	i/p of plate 7	_MAIN NOCON 3
%100004	%100004	i/p of plate 4	_MAIN NOCON 4
%100005	%100005	i/p of plate 5	_MAIN NOCON 5
%100006	%100006	i/p of plate 6	_MAIN NOCON 6
%100007	%100007	i/p of plate 8	_MAIN NOCON 7
%100008	%100008	car in i/p	_MAIN NOCON 45
			_MAIN NOCON 47
			_MAIN NOCON 49
			_MAIN NOCON 51
			_MAIN NOCON 53
			_MAIN NOCON 55
			_MAIN NOCON 89
			_MAIN NOCON 44
%100010	%100010	car out i/p	_MAIN NOCON 46
			_MAIN NOCON 48
			_MAIN NOCON 50
			_MAIN NOCON 52
			_MAIN NOCON 88

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%100001	%100001	mo of plt 1	_MAIN COLI
			_MAIN NOCON 8
			_MAIN NOCON 8
			_MAIN NOCON 9
			_MAIN NOCON 28
			_MAIN NOCON 48
			_MAIN NOCON 49
			_MAIN NOCON 56
			_MAIN NOCON 57
			_MAIN NOCON 57
%100002	%100002	mo of plt 2	_MAIN COLI 2

			_MAIN NOCON 11
			_MAIN NOCON 28
			_MAIN NOCON 32
			_MAIN NOCON 50
			_MAIN NOCON 51
			_MAIN NOCON 57
			_MAIN NOCON 57
%100003	%100003	selt of 6.10	_MAIN COLI 12
			_MAIN NOCON 13
			_MAIN NOCON 15
			_MAIN NOCON 37
%100004	%100004	mo of plt 4	_MAIN COLI 4
			_MAIN NOCON 11
			_MAIN NOCON 32
			_MAIN NOCON 52
			_MAIN NOCON 53
			_MAIN NOCON 59
			_MAIN NOCON 59
%100005	%100005	mo of plt 4	_MAIN COLI 5
			_MAIN NOCON 8

MSIT VersaPro (tm)

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%M00005	%M00005	m/o of plt. 5	_MAIN NOCON 10
			_MAIN NOCON 30
			_MAIN NOCON 54
			_MAIN NOCON 55
			_MAIN NOCON 59
			_MAIN NCCON 59
			_MAIN NCCON 62
%M00006	%M00006	m/o of plt. 6	_MAIN COIL 6
			_MAIN NOCON 12
			_MAIN NOCON 16
			_MAIN NOCON 39
			_MAIN NOCON 44
			_MAIN NOCON 45
			_MAIN NCCON 63
			_MAIN NOCON 63
			_MAIN NCCON 65
%M00007	%M00007	m/o of plt 7	_MAIN COIL 3
			_MAIN NOCON 13
			_MAIN NOCON 15
			_MAIN NOCON 61
			_MAIN NOCON 62
			_MAIN NOCON 63
			_MAIN NCCON 63
			_MAIN NOCON 69
			_MAIN NOCON 71
			_MAIN NOCON 73
			_MAIN NOCON 88
			_MAIN NOCON 89
			_MAIN NCCON 90
%M00010	%M00010	m/o of plt. 8	_MAIN COIL 7
			_MAIN NOCON 12
			_MAIN NOCON 16
			_MAIN NOCON 39
			_MAIN NOCON 46
			_MAIN NOCON 47
			_MAIN NCCON 66

%M00010	%M00010	m/o of plt. 8	_MAIN COIL 7 _MAIN NOCON 12 _MAIN NOCON 18 _MAIN NOCON 39 _MAIN NOCON 46 _MAIN NOCON 47 _MAIN NCCON 66
%M00012	%M00012	conf. of 1,5 plt	_MAIN COIL 8 _MAIN NOCON 9 _MAIN NOCON 10
%M00013	%M00013	conf. of plt. 1	_MAIN COIL 9 _MAIN NOCON 11 _MAIN NOCON 20 _MAIN NOCON 24 _MAIN NOCON 25
%M00014	%M00014	conf. of plt.5	_MAIN COIL 10 _MAIN NOCON 11 _MAIN NOCON 22 _MAIN NOCON 24 _MAIN NOCON 25
%M00015	%M00015	selet. of 1 blinkg	_MAIN COIL 20 _MAIN NOCON 21
%M00016	%M00016	selection of 1 blinkg	_MAIN COIL 22 _MAIN NOCON 23
%M00017	%M00017	o/p of R23	_MAIN COIL 24 _MAIN NOCON 25 _MAIN NOCON 27 _MAIN NOCON 68
%M00020	%M00020	status of 2,4 in 3	_MAIN COIL 25

MSIT VersaPro (tm)

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%M00020	%M00020	status of 2,4 in 3	_MAIN NOCON 26
%M00023	%M00023	o/p of R27	_MAIN NCCON 21 _MAIN NCCON 23 _MAIN COIL 27 _MAIN NOCON 28 _MAIN NOCON 30 _MAIN NOCON 32
%M00024	%M00024	blink of plt. 2	_MAIN COIL 28 _MAIN NOCON 29
%M00025	%M00025	blinkg of plt 4	_MAIN COIL 30 _MAIN NOCON 31
%M00026	%M00026	o/p of R31	_MAIN NCCON 29 _MAIN NCCON 31 _MAIN COIL 32 _MAIN NOCON 34 _MAIN NOCON 38
%M00027	%M00027	blinkg of 9	_MAIN NOCON 33 _MAIN COIL 38 _MAIN NOCON 39
%M00030	%M00030	o/p of R35	_MAIN NOCON 29 _MAIN NOCON 31 _MAIN NCCON 33 _MAIN COIL 34 _MAIN NOCON 35

%M00031	%M00031	o/p of R39	_MAIN NOCON 21 _MAIN NOCON 23 _MAIN NCCON 29 _MAIN NCCON 31 _MAIN COIL 35 _MAIN NOCON 36 _MAIN NOCON 58 _MAIN NCCON 60 _MAIN NOCON 61 _MAIN NCCON 68
%M00032	%M00032	o/p of R43	_MAIN NCCON 21 _MAIN NCCON 23 _MAIN COIL 36 _MAIN NCCON 68
%M00037	%M00037	blinker o/p	_MAIN COIL 13 _MAIN NOCON 16 _MAIN NOCON 18 _MAIN NOCON 20 _MAIN NOCON 22 _MAIN NOCON 28 _MAIN NOCON 30 _MAIN NOCON 38 _MAIN NOCON 64 _MAIN NOCON 69 _MAIN NOCON 81
%M00040	%M00040	blink of 6 pos.	_MAIN COIL 16 _MAIN NOCON 17
%M00041	%M00041	blinking of 8 pos.	_MAIN COIL 18 _MAIN NOCON 19
%M00042	%M00042	conf. of blinker to on	_MAIN COIL 11 _MAIN NOCON 13 _MAIN NOCON 15
%M00043	%M00043	o/p of R43	_MAIN NCCON 17 _MAIN NCCON 19

MSIT VersaPro (tm)

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%M00043	%M00043	o/p of R43	_MAIN COIL 37 _MAIN NOCON 38 _MAIN NOCON 40 _MAIN NOCON 42
%M00044	%M00044	to set M80	_MAIN COIL 40 _MAIN NOCON 41
%M00045	%M00045	o/p of R15 .t0 reset M80	_MAIN NOCON 17 _MAIN NOCON 19 _MAIN NCCON 39 _MAIN NCCON 39 _MAIN NCCON 39 _MAIN NCCON 41 _MAIN COIL 42 _MAIN NOCON 43 _MAIN NCCON 67
%M00046	%M00046	o/p of R19	_MAIN NCCON 17 _MAIN NCCON 19 _MAIN COIL 43
%M00050	%M00050	conf. of blink of 6 pos.	_MAIN COIL 17 _MAIN NOCON 65
%M00051	%M00051	conf. of blinkg of 8 pos.	_MAIN COIL 19 _MAIN NOCON 66

%M00052	%M00052	status of plt 9	_MAIN COIL 39 _MAIN NOCON 67
%M00060	%M00060	status of 6 plt	_MAIN NOCON 45 _MAIN COIL 45 _MAIN NOCON 62 _MAIN NOCON 65
%M00061	%M00061	status of plt 8	_MAIN COIL 47 _MAIN NOCON 47 _MAIN NOCON 66
%M00080	%M00080	to on/off blinkg 6,8	_MAIN COIL 41
%M00090	%M00090	car out status of 6	_MAIN COIL 44 _MAIN NCCON 45
%M00091	%M00091	car out status of 8 plt	_MAIN COIL 46 _MAIN NCCON 47
%M00100	%M00100	m/o to strt. R1	_MAIN COIL 13 _MAIN NOCON 14
%M00101	%M00101	o/p of R4(blinker)	_MAIN NCCON 13 _MAIN COIL 15
%M00120	%M00120	conf. of 1 blink	_MAIN COIL 21 _MAIN NOCON 56
%M00121	%M00121	conf. of 5 blink	_MAIN COIL 23 _MAIN NOCON 62
%M00122	%M00122	conf. of M20	_MAIN COIL 26 _MAIN NOCON 60
%M00123	%M00123	conf. of blink of plt 2	_MAIN COIL 29 _MAIN NOCON 58
%M00124	%M00124	conf. of blinkg of plt 4	_MAIN COIL 31 _MAIN NOCON 61
%M00125	%M00125	conf. of blinkg of 9	_MAIN COIL 33 _MAIN NOCON 67
%M00150	%M00150	status of 1 plt	_MAIN NOCON 49 _MAIN COIL 49 _MAIN NOCON 56
%M00151	%M00151	car avability of 2	_MAIN NOCON 25 _MAIN NOCON 51 _MAIN COIL 51

MSIT VersaPro (tm)

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%M00151	%M00151	car avability of 2	_MAIN NOCON 58
%M00152	%M00152	car avability in 4	_MAIN NOCON 25 _MAIN COIL 53 _MAIN NOCON 53 _MAIN NOCON 61 _MAIN NOCON 73
%M00153	%M00153	car availablity of plt 5	_MAIN COIL 55 _MAIN NOCON 55 _MAIN NOCON 61 _MAIN NOCON 62
%M00160	%M00160	selection of 1,2	_MAIN COIL 57 _MAIN NCCON 58
%M00161	%M00161	selection of 4,5	_MAIN COIL 59 _MAIN NCCON 61
%M00163	%M00163	car out status of 1	_MAIN COIL 48 _MAIN NCCON 49
%M00164	%M00164	car out status of 2	_MAIN COIL 50 _MAIN NCCON 51

%M00165	%M00165	car out status of 4	_MAIN COIL 52 _MAIN NCCON 53
%M00166	%M00166	car out status of 5	_MAIN COIL 54 _MAIN NCCON 55
%M00170	%M00170	blinkg of 7 pos	_MAIN COIL 69 _MAIN NOCON 70
%M00171	%M00171	conf. of blink of 7	_MAIN COIL 70 _MAIN NOCON 90
%M00172	%M00172	o/p of R47	_MAIN NCCON 61 _MAIN NOCON 68 _MAIN COIL 71 _MAIN NOCON 73 _MAIN NOCON 74
%M00173	%M00173	status of 4 plt whn 7 select	_MAIN NOCON 61 _MAIN COIL 72
%M00174	%M00174	conf. of plt in 3 pos whn 7 select	_MAIN NOCON 60 _MAIN COIL 73
%M00175	%M00175	o/p of R51	_MAIN NCCON 62 _MAIN NOCON 72 _MAIN COIL 74 _MAIN NOCON 76
%M00176	%M00176	status of 5 plt whn 7 select	_MAIN NOCON 62 _MAIN COIL 75
%M00177	%M00177	o/p of R55	_MAIN NCCON 65 _MAIN NOCON 75 _MAIN COIL 76 _MAIN NOCON 77
%M00178	%M00178	status of 6 whn 7 select	_MAIN NOCON 64 _MAIN COIL 80
%M00179	%M00179	o/p of R59	_MAIN NOCON 64 _MAIN NCCON 70 _MAIN COIL 77 _MAIN NOCON 78 _MAIN NOCON 80
%M00180	%M00180	o/p of R163	_MAIN COIL 78 _MAIN NOCON 79 _MAIN NOCON 81 _MAIN NOCON 82
%M00181	%M00181	blinkg of 9 whn 7 select	_MAIN NOCON 67 _MAIN COIL 81

MSIT VersaPro (tm)

Internal Memory (%M) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%M00182	%M00182	o/p of R67	_MAIN NCCON 79 _MAIN NCCON 81 _MAIN COIL 82 _MAIN NOCON 83
%M00183	%M00183	status of 6 whn 7 select	_MAIN COIL 79 _MAIN NCCON 80
%M00184	%M00184	o/p of R71	_MAIN NOCON 70 _MAIN NOCON 79 _MAIN COIL 83 _MAIN NOCON 84

%M00185	%M00185	o/p of R75	_MAIN NCCON 64 _MAIN NOCON 65 _MAIN NCCON 75 _MAIN NOCON 80 _MAIN COIL 84 _MAIN NOCON 85
%M00186	%M00186	o/p of R79	_MAIN NOCON 62 _MAIN NCCON 72 _MAIN COIL 85 _MAIN NOCON 86
%M00187	%M00187	o/p of R83	_MAIN NCCON 60 _MAIN NOCON 61 _MAIN NCCON 68 _MAIN NCCON 73 _MAIN COIL 86 _MAIN NOCON 87
%M00188	%M00188	o/p of R87	_MAIN NCCON 69 _MAIN COIL 87
%M00189	%M00189	car out status of 7	_MAIN COIL 88 _MAIN NCCON 89
%M00190	%M00190	car availablity of 7	_MAIN NOCON 89 _MAIN COIL 89 _MAIN NOCON 90
%M00191	%M00191	conf. blink of 6 whn 7 select	_MAIN COIL 64 _MAIN NOCON 65
%M00195	%M00195	selection of 7,6	_MAIN COIL 63
%M00200	%M00200	o/p of R1(blinker)	_MAIN NCCON 13 _MAIN COIL 14 _MAIN NOCON 15

Output (%Q) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%Q00001	%Q00001	o/p of 1 plt	_MAIN COIL 56
%Q00002	%Q00002	o/p of 2 plt	_MAIN COIL 58
%Q00003	%Q00003	o/p of 3 pos	_MAIN COIL 60
%Q00004	%Q00004	o/p of 4 plt	_MAIN COIL 61
%Q00005	%Q00005	o/p of 5 pos	_MAIN COIL 62
%Q00006	%Q00006	o/p of 6 pos.	_MAIN COIL 65
%Q00007	%Q00007	o/p of 7 plt	_MAIN COIL 90
%Q00008	%Q00008	o/p of 8 pos	_MAIN COIL 66
%Q00009	%Q00009	o/p of 9 pos	_MAIN COIL 67
%Q00010	%Q00010	status of vacant pos in 3	_MAIN COIL 68

Register (%R) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%R00001	%R00001	timer used for blinkg	_MAIN TMR_HUNDS 14

MSfT VersaPro (tm)

Register (%R) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%R00002	%R00001	timer used for blinkg	_MAIN [TMR_HUNDS] 14
%R00003	%R00001	timer used for blinkg	_MAIN [TMR_HUNDS] 14
%R00004	%R00004	timer used for blinkg	_MAIN TMR_HUNDS 15
%R00005	%R00004	timer used for blinkg	_MAIN [TMR_HUNDS] 15
%R00006	%R00004	timer used for blinkg	_MAIN [TMR_HUNDS] 15
%R00007	%R00007	blink of 9 whn 6/8 is slect	_MAIN TMR_HUNDS 37
%R00008	%R00007	blink of 9 whn 6/8 is slect	_MAIN [TMR_HUNDS] 37
%R00009	%R00007	blink of 9 whn 6/8 is slect	_MAIN [TMR_HUNDS] 37
%R00011	%R00011	to set M80	_MAIN TMR_HUNDS 40
%R00012	%R00011	to set M80	_MAIN [TMR_HUNDS] 40
%R00013	%R00011	to set M80	_MAIN [TMR_HUNDS] 40
%R00015	%R00015	blink of 6/8	_MAIN TMR_HUNDS 42
%R00016	%R00015	blink of 6/8	_MAIN [TMR_HUNDS] 42
%R00017	%R00015	blink of 6/8	_MAIN [TMR_HUNDS] 42
%R00019	%R00019	all stop 6/8	_MAIN TMR_HUNDS 43
%R00020	%R00019	all stop 6/8	_MAIN [TMR_HUNDS] 43
%R00021	%R00019	all stop 6/8	_MAIN [TMR_HUNDS] 43
%R00023	%R00023	plate shift to pos 3 when 1/5 is slect	_MAIN TMR_HUNDS 24
%R00024	%R00023	plate shift to pos 3 when 1/5 is slect	_MAIN [TMR_HUNDS] 24
%R00025	%R00023	plate shift to pos 3 when 1/5 is slect	_MAIN [TMR_HUNDS] 24
%R00027	%R00027	blink of plt 2/4	_MAIN TMR_HUNDS 27
%R00028	%R00027	blink of plt 2/4	_MAIN [TMR_HUNDS] 27
%R00029	%R00027	blink of plt 2/4	_MAIN [TMR_HUNDS] 27
%R00031	%R00031	blink of 9 whn 1/5 is slect	_MAIN TMR_HUNDS 32
%R00032	%R00031	blink of 9 whn 1/5 is slect	_MAIN [TMR_HUNDS] 32
%R00033	%R00031	blink of 9 whn 1/5 is slect	_MAIN [TMR_HUNDS] 32
%R00035	%R00035	blink of 2(backwrd) whn 1/5 is slect	_MAIN TMR_HUNDS 34
%R00036	%R00035	blink of 2(backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 34
%R00037	%R00035	blink of 2(backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 34
%R00039	%R00039	blink of 1(backwrd) whn 1/5 is slect	_MAIN TMR_HUNDS 35
%R00040	%R00039	blink of 1(backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 35
%R00041	%R00039	blink of 1(backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 35
%R00043	%R00043	plt shift from 3 t0 2 or 3 to 4 (backwrd) whn 1/5 is slect	_MAIN TMR_HUNDS 36
%R00044	%R00043	plt shift from 3 t0 2 or 3 to 4 (backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 36
%R00045	%R00043	plt shift from 3 t0 2 or 3 to 4 (backwrd) whn 1/5 is slect	_MAIN [TMR_HUNDS] 36
%R00047	%R00047	plt shift to pos 3 from pos4 whn 7 is slect	_MAIN TMR_HUNDS 71
%R00048	%R00047	plt shift to pos 3 from pos4 whn 7 is slect	_MAIN [TMR_HUNDS] 71
%R00049	%R00047	plt shift to pos 3 from pos4 whn 7 is slect	_MAIN [TMR_HUNDS] 71
%R00051	%R00051	plt shift from 5 to 4	_MAIN TMR_HUNDS 74
%R00052	%R00051	plt shift from 5 to 4	_MAIN [TMR_HUNDS] 74
%R00053	%R00051	plt shift from 5 to 4	_MAIN [TMR_HUNDS] 74
%R00055	%R00055	plt shift from 6 to 5	_MAIN TMR_HUNDS 76
%R00056	%R00055	plt shift from 6 to 5	_MAIN [TMR_HUNDS] 76
%R00057	%R00055	plt shift from 6 to 5	_MAIN [TMR_HUNDS] 76
%R00059	%R00059	blinkg of 6 whn 7 slect	_MAIN TMR_HUNDS 77
%R00060	%R00059	blinkg of 6 whn 7 slect	_MAIN [TMR_HUNDS] 77
%R00061	%R00059	blinkg of 6 whn 7 slect	_MAIN [TMR_HUNDS] 77
%R00067	%R00067	blinkg of 6(backwrd) whn 7 slect	_MAIN TMR_HUNDS 82
%R00068	%R00067	blinkg of 6(backwrd) whn 7 slect	_MAIN [TMR_HUNDS] 82
%R00069	%R00067	blinkg of 6(backwrd) whn 7 slect	_MAIN [TMR_HUNDS] 82
%R00071	%R00071	blinkg of 7(backwrd) whn 7 is slect	_MAIN TMR_HUNDS 83
%R00072	%R00071	blinkg of 7(backwrd) whn 7 is slect	_MAIN [TMR_HUNDS] 83

MSIT VersaPro (tm)

Register (%R) CROSS REFERENCES

REF.	VARIABLE NAME	REF. DESCRIPTION	BLOCK INSTR/RUNG#
%R00073	%R00071	blinkg of 7(backwrd) whn 7 is slect	_MAIN [TMR_HUNDS] 83
%R00075	%R00075	plt shift from 5 to 6	_MAIN TMR_HUNDS 84
%R00076	%R00075	plt shift from 5 to 6	_MAIN [TMR_HUNDS] 84
%R00077	%R00075	plt shift from 5 to 6	_MAIN [TMR_HUNDS] 84
%R00079	%R00079	plt shift from 5 to 4	_MAIN TMR_HUNDS 85
%R00080	%R00079	plt shift from 5 to 4	_MAIN [TMR_HUNDS] 85
%R00081	%R00079	plt shift from 5 to 4	_MAIN [TMR_HUNDS] 85
%R00083	%R00083	plt shift from 3 to 4	_MAIN TMR_HUNDS 86
%R00084	%R00083	plt shift from 3 to 4	_MAIN [TMR_HUNDS] 86
%R00085	%R00083	plt shift from 3 to 4	_MAIN [TMR_HUNDS] 86
%R00087	%R00087	all stop (when 7 slect)	_MAIN TMR_HUNDS 87
%R00088	%R00087	all stop (when 7 slect)	_MAIN [TMR_HUNDS] 87
%R00089	%R00087	all stop (when 7 slect)	_MAIN [TMR_HUNDS] 87
%R00163	%R00163	blinkg of 9 whn 7 slect	_MAIN TMR_HUNDS 78
%R00164	%R00163	blinkg of 9 whn 7 slect	_MAIN [TMR_HUNDS] 78
%R00165	%R00163	blinkg of 9 whn 7 slect	_MAIN [TMR_HUNDS] 78

MSIT VersaPro (tm)

- no use * explicit use + implicit use # explicit and implicit use

Input (%I) USAGE

```
REF.     |64      |56      |48      |40      |32      |24      |16      |8      |1
ADDRESS  +------- +------- +------- +------- +------- +------- +------- +------+
%I00064                                                          *_ ********
```

Internal Memory (%M) USAGE

```
REF.     |64      |56      |48      |40      |32      |24      |16      |8      |1
ADDRESS  +------- +------- +------- +------- +------- +------- +------- +------+
%M00064  ___**___ ____***_ __****** *__*____ ***__*** **__*__* *****_*_ _*******
%M00128  ___***** *_______ _______ ___**___ _____**_ _______ *_______ _______
%M00192  _******* ******** *******_ __****_* *______* ***_____ _______ _______
%M00256                                                                 *____*__
```

Output (%Q) USAGE

```
REF.     |64      |56      |48      |40      |32      |24      |16      |8      |1
ADDRESS  +------- +------- +------- +------- +------- +------- +------- +------+
%Q00064                                                          ** ********
```

Register (%R) USAGE

```
REF.     |50         |40         |30         |20         |10       |1
ADDRESS  +---------- +---------- +---------- +---------- +---------+
%R00050  -++*-++*-+ +*-++*-++* -++*-++*-+ +*-++*-++* -++*++*++*
%R00100  ---------- -++*-++*-+ +*-++*-++* -++*-----+ +*-++*-++*
         There were no references used in the range:  %R00101 - %R00150
%R00200                                    ++*-- ----------
```

REFERENCES :

1. RamleelaKhare, Dr.Fillliperodrigues, & E. Mela; " Automation of water distribution plant", International journal of Research in Engineering and Advanced Technology, Vol.2, pp:1-6, 2014.
2. Aunbhapanchal, Ketakee Dagade, Shubhangi Tamhane, Kiran Pawar, & Paradnya Ghadge; "Automated water supply system & Water theft Identification Using PLC and SCADA", International journal of Engineering Research and Applications, Vol.4, Issue.4, pp: 67-69, April 2014.
3. Ayamal Alinhussein & Mohammed Adedalati; " A Supervisitory Control and Data Acquistion (SCADA) for water pumping station of GAZA", The Islamic University Journal, Vol.19, pp:303-321, 2011
4. J.P. Shridharanyaa, Jagadeesan.A, & Lavanya. A; "Theft Identification and Automated Water Supply System Using Embedded Technology", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.2, pp:1-7, 2013.
5. Eswaran .P,& Aswin Kumar; " Conceptual Design and Development of Water Metering System for Multiple family Residential Buildings", International Journal of Advanced Computer Research, Vol.2, No.4, Issue. 6, December, 2012.
6. T.Karuppiah, Sivasankaran V, Azha , Periasamy, Muruganand S¯Embedded System Based Industrial Power Plant Boiler Automation Using GSM Technology IJARCCE Vol. 2, Issue 8, August 2013.
7. Chuntanman, Jia Li,Lanying Wang,Yantao Chi ¯The fuzzy PID control system for superheated steam temperature of boiler Strategic Technology (IFOST) , IEEE International Conference ,Volume 2, pp. 967-970, June-2011.
8. K. Ghousiya Begum Mercy D, Kiren Vedi H, Ramathilagam V ¯An Intelligent Model Based Level Control of Boiler Drum IJETAE Volume 3, Issue 1, January 2013.
9. T.Karuppiah, Sivasankaran V, Azha , Periasamy, Muruganand S¯Embedded System Based Industrial Power Plant Boiler Automation Using GSM Technology IJARCCE Vol. 2, Issue 8, August 2013.
10. B.G Liptak, "Process Control and Optimization" Butterworth-Heinemann Ltd, Volume 2, ISBN 0-8493-1081-4 (v. 2).