USER'S MANUAL

F3 BPC1

BOOSTER PUMP CONTROLLER (2/3 PUMPS)

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SCOPE:

The scope of this USER MANUAL is limited to the Booster Pump Controller model "**F3 BPC1"** designed, manufactured, marketed and serviced by MINILEC. The scope is further limited to the extent of Technical specifications enlisted in this USER MANUAL only. Users should not refer this manual for using any other product other than model "F3 BPC1" with unspecified technical specifications and features.

INTRODUCTION:

A complex manufacturing plant without centralized monitoring and control equipment is un-imaginable. Similarly centralized monitoring and control equipment without a logic controller is a rare find.

MINILEC – A well-known name in the field of electronic motor protection and microprocessor based Annunciation systems, offers its unique **Booster Pump Controller** based on single chip micro-controller technology with a totally new face-lift and with considerable size reduction with molded enclosure.

Thanks for selecting Minilec make product **F3 BPC1**. These highly reliable and compact systems offer Logic controller with pre-programmed operating sequence as per customer requirement.

GENERAL SPECIFICATIONS

SR. NO.	PARAMETER	DESCRIPTION
01	AUX. SUPPLY VOLTAGE	90 TO 270 VAC / DC
02	FREQUENCY [AC SUPPLY]	50 / 60 Hz, ± 3 %
03	INPUT SPECIFICATIONS	POTENTIAL FREE INPUT CONTACT
04	DIGITAL INPUT DETAILS	PRESSURE SWITCH I/P-1 - (PS1) PRESSURE SWITCH I/P-2 - (PS2) } PRESSURE SWITCH PRESSURE SWITCH I/P-3 (**NOTE1)** - (PS3) } CONTACTS PUMP1 OVERLOAD - (O/L1) PUMP2 OVERLOAD - (O/L2) } TRIP CONTACTS. PUMP3 OVERLOAD (**NOTE1)** - (O/L3) HIGH LEVEL SENSOR - (HL) LOW LEVEL SENSOR - (LL) } WATER LEVEL INPUTS RESTART LEVEl - (RST) } (4 ELECTRODES)
05	DIGITAL OUTPUT DETAILS	PUMP1 RELAY (C-NO-NC) PUMP2 RELAY (C-NO-NC) PUMP3 RELAY (C-NO-NC) (**NOTE1)** ALARM RELAY (C-NO-NC)
06	CONTACT RATING	5 AMP@ 240 VAC (RESISTIVE)
07	INDICATIONS	1. POWER ON - POWER ON [FLASHING] / POWER OFF [OFF]. 2. PUMP 1 - PUMP1-ON [STEADY] / PUMP1- OFF [OFF] / PUMP1-TRIP [FLASHING]. 3. pump 2 - PUMP2-ON [STEADY] / PUMP2- OFF [OFF] / PUMP2-TRIP [FLASHING]. 4. Pump 3 (**NOTE1)** - PUMP3-ON [STEADY] / PUMP3- OFF [OFF] / PUMP3-TRIP [FLASHING].
08	FRONT KEY	FOUR PROGRAMMABLE KEYS, MENU, UP, DOWN, ENTER.
09	ON DELAY	PROGRAMMABLE BY FRONT KEYBOARD (1 TO 15 SEC± 1SEC OF SET TIME)
10	OFF DELAY	PROGRAMMABLE BY FRONT KEYBOARD (1 TO 15 SEC± 1SEC OF SET TIME)
11	AUTO / MANUAL SELECTION	PROGRAMMABLE BY FRONT KEYBOARD.
12	ALARM MUTE	BY FRONT KEYBOARD.
13	COMMUNICATION	RS-485 (optional)
14	ENCLOSURE	ABS
15	DIMENSIONS OVERALL (L x W x D) (mm) PANEL CUTOUT (L x W) (mm)	 96 X 96 X 137 mm 92 X 92 mm
16	MOUNTING	DOOR / FLUSH MOUNTING TYPE
17	WEIGHT (Approx.)	550 Gms
18	OPERATING TEMPERATURE	0 °C TO +60 °C
19	HUMIDITY	UPTO 95% rh.

INDICATION DETAILS:-

POWER (GREEN): FOR POWER ON [FLASHING] / POWER OFF [OFF].
PUMP-1(RED) : FOR PUMP1-ON [STEADY] / PUMP1- OFF [OFF] / PUMP1-TRIP [FLASHING].
PUMP-2(RED) : FOR PUMP2-ON [STEADY] / PUMP2- OFF [OFF] / PUMP2-TRIP [FLASHING]

PUMP-3(RED) (**NOTE1)** : FOR PUMP3-ON [STEADY] / PUMP3- OFF [OFF] / PUMP3-TRIP [FLASHING]
NOTE: -

- ON DELAY - PUMP WILL START AFTER SET ON DELAY.
- OFF DELAY - PUMP WILL STOP AFTER SET OFF DELAY.
- FOURTH ELECTRODE OF WATER LEVEL INPUT IS COMMON REFERANCE ELECTRODE.
- PRESSURE SWITCHES, TRIP INPUT RELAYV AND WATER LEVEL ELECTRODES ARE NOT IN THE SCOPE OF MINILEC.

OPERATION PHILOSOPHY

F3 BPC1 is designed for Automatic Sequencing & control of Booster Pumps, based on latest single chip microcontroller technology. F3 BPC1 (3 Pumps) has a facility of sensing 9 nos digital inputs while F3 BPC1 (2 Pumps) has a facility of sensing 7 nos digital inputs. These digital inputs include pressure switches, Level sensors & respective Pump Trip inputs. F3 BPC1 (3 Pumps) has 4 relay outputs while F3 BPC1 (2 Pumps) has 3 relay outputs. These relay outputs are for Pumps & Alarm. LED indications will show the status of Pumps, (ON / OFF / TRIP). We have given 4 keys & 16x2 LCD display for programming. Using these four function keys, menu, up, down & enter we can change the setting of various parameters.

DIGITAL INPUT DETAILS:

SR. NO	DIGITAL INPUT	DETAILS	OPERATING CONDITION
1	**PS1**	Pressure Switch 1	When PS1 this input becomes low.
2	**PS2**	Pressure Switch 2	When PS2 this input becomes low.
3	**PS3** (NOTE1)	Pressure Switch 3	When PS3 this input becomes low.
4	**O/L1**	Overload Trip I/P for Pump1	When O/L1 this input becomes low.
5	**O/L2**	Overload Trip I/P for Pump2	When O/L2 this input becomes low.
6	**O/L3** (NOTE1)	Overload Trip I/P for Pump3	When O/L3 this input becomes low.
7	**HL**	High Level Sensor	When Upper Tank is full this input becomes low.
8	**LL**	Low Level Sensor	When Lower Tank is empty this input becomes high.
9	**RST**	Restart Level Sensor	If Restart Level in lower tank is absent, I/P will become high & if level present, I/P will become low & restarts the Pumps.

DIGITAL OUTPUT DETAILS:

SR. NO	DIGITAL OUTPUT	OUTPUT	CONTACT TYPE	FUNCTION / ACTION
1.	**DO – 1**	PUMP 1 OUTPUT	**NO**	Relay becomes on to turn on PUMP1.
2.	**DO – 2**	PUMP 2 OUTPUT	**NO**	Relay becomes on to turn on PUMP2.
3.	**DO – 3** (NOTE1)	PUMP 3 OUTPUT	**NO**	Relay becomes on to turn on PUMP3.
4.	**DO – 4**	ALARM OUTPUT	**NO**	Relay becomes on to turn on Alarm.

INDICATIONS:

SR.NO	INDICATION	FUNCTION		COLOUR
		LED: STEADY ON	LED: FLASHING	
1.	**POWER ON**	--	Unit supply is healthy.	Green
2.	**PUMP - 1**	PUMP 1 is ON.	PUMP 1 is TRIP.	Red
3.	**PUMP - 2**	PUMP 2 is ON.	PUMP 2 is TRIP.	Red
4.	**PUMP – 3** (NOTE1)	PUMP 3 is ON.	PUMP 3 is TRIP.	Red

SETTING MODE:

Before going to study the logic operation we will see the setting parameter / facility provided in F3 BPC1.

1. As soon as we switch on the supply POWER ON LED on front start flashing. This LED indicates internal circuitry is working satisfactory.(WATCH DOG)
2. For 3 Pumps version, LCD display will show “MINILEC: F3 BPC1” & “3 PUMPS CONTROL” & will flash it for 2 to 3 times.
   For 2 Pumps version, LCD display will show “MINILEC: F3 BPC1” & “2 PUMPS CONTROL” & will flash it for 2 to 3 times.
3. Then LCD display will show “SYSTEM RUNNING” & “PRESSURE SW.: XX” considering all inputs are in healthy condition. Pressure SW shows the no of pressure switches inputs (XX) that are present now.
4. By pressing “MENU” key we can see the Setting Parameters. In setting mode we have to set following listed parameters. For parameter setting F3 BPC1 will ask for PASSWORD.
5. Use “Up” & “Down” keys to select the correct password. Press “Enter” key to enter the password.

6. If wrong password is entered, unit will display the message as “INCORRECT PASSWORD” & will come out of setting parameters. & if correct password is entered, it will display “CORRECT PASSWORD”.
7. Master Password is 10, in case if user forgets his password. Password setting can be seen only if correct password is fed.
8. After feeding the correct password you can change the parameter values. For more details refer the following chart of parameter settings.

PARAMETER SETTINGS:

SR. NO.	PARAMETER	RANGE	FACTORY SET	MESSAGES ON LCD DISPLAY
1.	PUMP1 SELECTION	AUTO / MANUAL	AUTO	" PUMP1 SELECTION " "SELECT : AUTO "
2.	PUMP2 SELECTION	AUTO / MANUAL	AUTO	" PUMP2 SELECTION " "SELECT : AUTO "
3.	PUMP3 SELECTION (**NOTE1)**	AUTO / MANUAL	AUTO	" PUMP3 SELECTION " "SELECT : AUTO "
4.	PUMP1 ON DELAY	01 – 15 SEC	05	" ON DELAY " " PUMP1 : XX SEC"
5.	PUMP2 ON DELAY	01 - 15 SEC	05	" ON DELAY " " PUMP2 : XX SEC"
6.	PUMP3 ON DELAY (**NOTE1)**	01 - 15 SEC	05	" ON DELAY " " PUMP3 : XX SEC"
7.	PUMP1 OFF DELAY	01 - 15 SEC	05	" OFF DELAY " " PUMP1 : XX SEC"
8.	PUMP2 OFF DELAY	01 - 15 SEC	05	" OFF DELAY " " PUMP2 : XX SEC"
9.	PUMP3 OFF DELAY (**NOTE1)**	01 - 15 SEC	05	" OFF DELAY " "PUMP3 : XX SEC"
10.	DEVICE ID SELECTION	01 – 99	01	“ DEVICE ID ” "SELECT : XX "
11.	SET TO FACTORY SETTINGS	YES / NO	YES	“SET TO FACTORY” “SETTINGS : YES ”
12.	PASSWORD SETTING	01 – 99	01	"CHANGE PASSWORD " “ SELECT : XX “

OPERATING SEQUENCE FOR 2 PUMPS SYSTEM:

CYCLE	STAGE	NO OF PS IN ON STATE	PUMP1	PUMP2	M1	M2/SB
1	1	1	M1	SB	ON	OFF
	2	2	M1	M2	ON	ON
	3	0	-	-	OFF	OFF
2	1	1	SB	M1	ON	OFF
	2	2	M2	M1	ON	ON
	3	0	-	-	OFF	OFF
REPEAT FROM CYCLE 1						

- In stage 1 of each cycle – M1 turns ON & M2/SB remains OFF.
- In stage 2 of each cycle – M1 remains ON, M2/SB acts as M2 & Turns ON.
- If M1 Trips (O/L) at Stage 1 of any cycle, then M2/SB acts as SB and turns ON in place of M1.
- If M1 Trips (O/L) at Stage 2 of any cycle, then M2/SB acts as M2 as well as SB and remains ON.
- Alarm will be turned ON for every Trip Condition.
- If PUMP1 overload(O/L1) PUMP1 indication LED start flashing and LCD will show message “ PUMP : 1 O/L ”. and standby pump will ON as per above chart , after completing ON delay as per setting.
- If PUMP2 overload(O/L2) PUMP2 indication LED start flashing and LCD will show message “ PUMP : 2 O/L ”. and standby pump will ON as per above chart , after completing ON delay as per setting.
- If PUMP 1 and 2 overload(O/L) PUMP1 and PUMP2 LED starts flashing and LCD will show message “ PUMP: 1,2 O/L ”. and both pumps will remain OFF.

OPERATING SEQUENCE FOR 3 PUMPS SYSTEM:

SR. NO. CYCLES	STAGE	NO OF PS IN ON STATE	PUMP1	PUMP2	PUMP3	M1	M2	M3
1	1	1	M1	M2	SB	ON	OFF	OFF
	2	2	M1	M2	SB	ON	ON	OFF
	3	3	M1	M2	M3	ON	ON	ON
	4	0	-	-	-	OFF	OFF	OFF
2	1	1	M3	M1	M2	ON	OFF	OFF
	2	2	M3	M1	M2	ON	ON	OFF
	3	3	M3	M1	M2	ON	ON	ON
	4	0	-	-	-	OFF	OFF	OFF
3	1	1	M2	SB	M1	ON	OFF	OFF
	2	2	M2	SB	M1	ON	ON	OFF
	3	3	M2	M3	M1	ON	ON	ON
	4	0	-	-	-	OFF	OFF	OFF
REPEAT FROM CYCLE 1								

- In Stage 1 of each Cycle – M1 Turns ON, M2 & M3 / SB remains Off.
- In Stage 2 of each Cycle – M1 remains ON, M2 Turns ON & M3 / SB remains Off.
- In Stage 3 of each Cycle – M1, M2 remains ON & M3 / SB acts as M3 & turns On.
- If M1 Trips at Stage 1 & 2 of any cycle, then M3 / SB acts as SB & turns On in place of M1.
- If M2 Trips at Stage 1 & 2 of any cycle, then M3 / SB acts as SB & turns On in place of M2.
- If M1 or M2 Trips at Stage 3 of any cycle, then M3 / SB acts as SB as well as SB, in place of M1 or M2 respectively & remains On.
- On & Off Delay comes in picture for each Pump while turning On & Off respectively.
- Alarm will be turned On for every Trip Condition. It can be turned off by pressing Up + Down keys simultaneously.

AUTO / MANUAL FUNCTION:

TWO PUMPS SYSTEM

- The pump kept in MANUAL mode remains OFF and does not operate as per pressure switches.
- The pump kept in AUTO mode operates as per pressure switches.
- If both the pumps are kept in MANUAL mode, both pumps remain OFF.

THREE PUMPS SYSTEM

SR. NO.	PUMPS KEPT IN MANUAL MODE [REMAINS OFF]	REMAINING PUMPS KEPT IN AUTO MODE [OPERATES WITH PRESSURE SWITCHES]
1.	PUMP1	PUMP2 & PUMP3 [OPERATES AS M1 & M2 / SB]
2.	PUMP2	PUMP1 & PUMP3 [OPERATES AS M1 & M2 / SB]
3.	PUMP3	PUMP1 & PUMP2 [OPERATES AS M1 & M2 / SB]
4.	PUMP1 & PUMP2	PUMP3
5.	PUMP1 & PUMP3	PUMP2
6.	PUMP2 & PUMP3	PUMP1
7.	PUMP1, PUMP2 & PUMP3	---

At end of Manual Mode, Auto Mode starts from Cycle1.

WATER LEVEL CONTROL FUNCTION:

- **HL (High Level Input):** This sensor is in Upper Tank, along with common. Alarm Turns On when this I/p is received. LCD display will show "HIGH LEVEL TRIP" message. All Pumps remains On as per operation.
- **LL (Low Level Inpuit):** This sensor is in Lower Tank, along with Restart Sensor & Common. When LL input is absent along with RST input, Low level is detected. Then all Pumps are turned Off & Alarm is turned On. LCD display will show "LOW LEVEL TRIP" message.
- **RST (Restart Level Inpuit):** Once the Pumps are turned off by Low Level, then they will turn On, only if the Restart Level is achieved, i.e RST Level input with Low Level input.

ABBREVIATIONS USED:

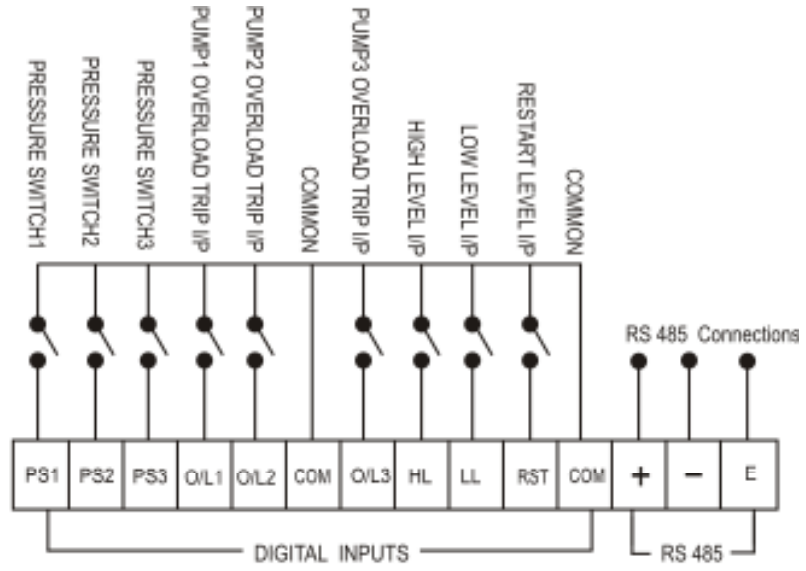
M1: Main 1st Pump. **M2**: Main 2nd Pump. **M3**: Main 3rd Pump. **(NOTE1)** **SB**: Stand By Pump.
P1: Pump 1 **P2**: Pump 2 **P3**: Pump3 (**NOTE1)**
OL1: Pump1 Overload **OL2**: Pump2 Overload **OL3**: Pump3 Overload (**NOTE1)**
LL: Low Level. **HL**: High Level. **RST**: Restart Level.

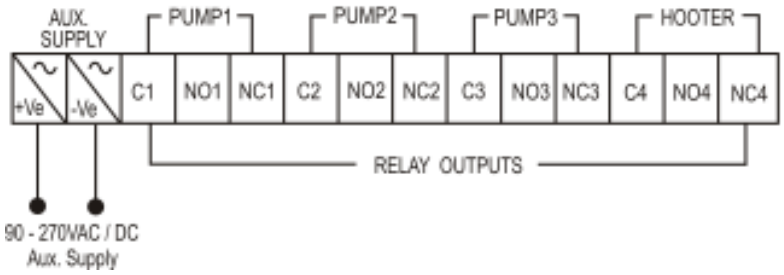
ALARM MUTE: The alarm can be turned OFF only by pressing **UP + DOWN** keys simultaneously.

NOTE1: PRESENT ONLY IN F3 BPC1 (3 PUMPS) UNIT AND NOT IN F3 BPC1 (2 PUMPS) UNIT.

EXTERNAL CONNECTION DIAGRAM:

A) THREE PUMPS SYSTEM





B) TWO PUMPS SYSTEM