

## INTRODUCTION

- ▶ Most accident happens due to the disregard of basic safety rules or precautions. In order to prevent accidents from happening, the factors responsible for accidents must be avoided beforehand.

For this reason, please read this manual and fully understand the precautions for safety and the proper procedures and directions for inspection and maintenance before starting operation.

Performing maintenance and repair without adequate knowledge may cause inadvertent accidents.

- ▶ It is not possible to cover all the possible cases of accidents in this "TROUBLESHOOTING MANUAL". Therefore, attention should be given to precautions other than the ones mentioned in this "TROUBLESHOOTING MANUAL". Especially, when repair and maintenance work which are not covered in this "TROUBLESHOOTING MANUAL" are carried out, always work under the direction of an instructor who understands the matter.

### [Control System Transition]


Model	IGBT Control	FET Control	FET with New Accelerator	CAN-BUS Control
FBR 9 ~ 13 - 75	~121AD3316 / 121AD3502 /121AD3531 ~ 121AD5342	121AD3317 ~ 121AD3530	121AD5343 ~ 121AD7827	121AD7828~
FBR 10H / 13H - 75	~124AE0278	124AE0279 ~ 124AE0613	124AE0614 ~ 124AE0949	124AE0950~
FBR 14 ~ 18 - 75	~131AE5117	131AE5118 ~ 131AF1005	131AF1006 ~ 131AF6827	131AF6828-
FBR 20 / 25 - 75	~141AE0946 /141AE1033 ~141AE1618	141AE0947 ~ 141AE1032	141AE1619 ~ 141AE2451	141AE2452-
FBR 30 ~ 40 - 75	~171AE0104 /171AE0113 ~ 171AE0191	171AE0105 ~ 171AE0112	171AE0192 ~ 171AE0289	171AE0290-



- ▶ Please note that the contents of the explanation in this manual are different according to each control system.  
Please refer to the applicable explanations.

# ■ Using this "TROUBLESHOOTING MANUAL"

This manual has information about the layout and names of main components, procedures for disassembly, assembly, inspection, adjustment, maintenance, and hints for troubleshooting which are in effect mainly for the model FBR-75 .

Since the parts used in this machine are subject to change for the sake of better quality, performance enhancement and safety, some portions of the contents and illustrations of this "TROUBLESHOOTING MANUAL" may not be identical.

Directions with  and  marks are very important, and must be followed.

	<b>DANGER</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. You must follow this instruction.
	<b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. You must follow this instruction.
	<b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. You must follow this instruction.
	<b>NOTE</b>	Indicates suggestions, tips and hints related to the safety of a operator and maintain of truck.

## 1. Personnel this "TROUBLESHOOTING MANUAL" is aimed at:

This "TROUBLESHOOTING MANUAL" is directed at personnel who possess sufficient knowledge and technical expertise. If you do not understand any of the contents of this "TROUBLESHOOTING MANUAL", perform operation under the guidance of personnel who does.

## 2. Conditions of a facility

The work conditions described in the "TROUBLESHOOTING MANUAL" are written on the assumption that the work is performed at a standard work facilities and tools for the maintenance of NICHYU ELECTRIC LIFT TRUCKS are available.

For safe and reliable maintenance, the work should be performed at a shop which is equivalent to these described in this "TROUBLESHOOTING MANUAL" with following all instructions strictly.

# CONTENTS

<b>1. Introduction</b>	<b>1</b>		
1-1. What's new in FBR-75 (IGBT and FET Control) .....	1		
1-2. What's new in FBR-75 (CAN-BUS Control) .....	2		
<b>2. Adjustment of SICOS-AC</b>	<b>3</b>		
2-1. Explanation of the monitor display .....	3		
2-1-1. Indicator panel	3		
2-1-2. Indication of display	4		
2-1-3. Function of display	5		
2-1-4. Various kinds of mode selection	12		
2-2. Explanation of the MPU board .....	23		
2-2-1. Basic control board construction	23		
2-2-2. MPU board	24		
2-2-3. Display board	25		
2-2-4. EPS controller (EPS / DSP board)	25		
2-2-5. MPU board setting	27		
2-2-6. Display board setting : IGBT and FET Control EPS controller (EPS/DSP board) setting : CAN-BUS Control	28		
2-2-7. Adjustment Standards List for FBR-75 series	30		
2-2-8. Other settings	32		
2-3. SICOS-AC check and adjustment .....	34		
2-3-1. Chassis insulation check	34		
2-3-2. Battery voltage calibration	35		
2-3-3. Current sensor check	36		
2-3-4. Model setting	38		
2-3-5. Safety circuit for control (contactor tripping) check	39		
2-3-6. Hydraulic speed setting and adjustment	41		
2-3-7. Descending regeneration check	44		
2-3-8. Switch plugging (back) regenerative braking force adjustment	44		
2-3-9. Regenerative braking force check and adjustment	45		
2-3-10. Anti-slip (high performance series) adjustment	47		
2-3-11. Front wheel brake (high performance series) check	48		
2-3-12. Auto suspension check	48		
2-3-13. Display monitor symbol (icon) check and setting	49		
2-3-14. Display language check and setting	50		
2-3-15. Optional function check and setting	51		
2-3-16. Load sensor working check and calibration (OPTION)	56		
2-3-17. Display brightness check and adjustment	58		
2-3-18. Hour meter working check	59		
2-3-19. Auto power off function working check	59		
2-3-20. OIS (Operation Interlock System) working check	60		
2-3-21. Battery electrolyte level working check (OPTION)	61		
2-3-22. Turn signal lamp working check	61		
2-3-23. Hydraulic oil level warning working check (OPTION)	62		
2-3-24. Overload working check (OPTION)	62		
2-3-25. Travel inhibitor working check (OPTION)	63		
2-3-26. Cooling fan working check	63		
2-3-27. Over discharge lift lock working check (OPTION)	64		
2-3-28. Turning speed reduction adjustment and working check (OPTION)	66		
2-3-29. Laser pointer working check (OPTION)	66		
2-3-30. Accelerator potentiometer adjustment	67		
2-3-31. Steering angle potentiometer adjustment	70		
2-3-32. Tyre diameter data adjustment	72		
2-3-33. Battery front loading (travel/hydraulic interlock)	72		
2-3-34. Cancellation of Auto suspension function	72		
2-3-35. Built-in charger working check (OPTION)	73		
2-3-36. Confirmation the charging electricity usage and consumption rate setting (OPTION)	75		

### **3. Trouble shooting 78**

3-1. Self diagnosis function .....	78
3-1-1. Display	78
3-1-2. Error messages and Display conditions	81
3-2. Error history memory.....	86
3-2-1. Error history memory 1	86
3-2-2. Error history memory 2	88
3-2-3. Clearing the error history memory (memory initialization)	90
3-3. I/O Check .....	91
3-3-1. I/O check mode display method	91
3-3-2. I/O port table	93

### **4. Wiring and main controller layout 113**

### **5. Reference 190**

5-1. MPU board connectors.....	190
5-1-1. Pin arrangement of connector housing	190
5-1-2. Name of parts	190
5-1-3. Installation of terminals into housing	191
5-1-4. How to extract terminals	192
5-1-5. Crimp tools (manufactured by AMP)	193
5-2. Water resistant connector .....	194
5-2-1. Water resistant connectors	194
5-2-2. Water resistant connectors (other than those described above)	194

# 1. Introduction

## 1-1. What's new in FBR-75 (IGBT and FET Control)

<b>A</b>	Equipped with Sicos-AC
<ul style="list-style-type: none"> <li>● Improved inching</li> <li>● Enhanced regeneration</li> <li>● Settings for various modes, power mode, and low speed</li> <li>● Auto power OFF</li> <li>● Neutral safety</li> <li>● Self-diagnosis function</li> <li>● Contactless traveling, loading and regeneration</li> </ul>	

<b>C</b>	Sensor-less hydraulic control (Enhanced board and software)
<ul style="list-style-type: none"> <li>● Enhanced software (auto suspension, front brakes, hydraulic response)</li> </ul>	

<b>F</b>	Type VE controller
<ul style="list-style-type: none"> <li>● Mono-blocked heat sink and base, mono-blocked gate board, mono-blocked condenser (soldering) etc.</li> </ul>	

<b>U</b>	<input type="checkbox"/> Change the pipe Comp. figure
----------	---

<b>R</b>	<input type="checkbox"/> Chain anchor (lift BKT)
----------	--

<b>S</b>	<input type="checkbox"/> Lift BKT chain entanglement prevention
<ul style="list-style-type: none"> <li>● Side roller installation / stopper cancellation</li> </ul>	

<b>K</b>	Made laser pointer optional
----------	-----------------------------

<b>T</b>	<input type="checkbox"/> Change the tilt bar's figure on both ends
----------	--

<b>W</b>	<input type="checkbox"/> Change the tilt cylinder structure
<ul style="list-style-type: none"> <li>● FBR9-18</li> </ul>	

<b>M</b>	Plasticized oil tank (front loading on FBR 15 series)
Commonized with side loading models	

<b>Q</b>	<input type="checkbox"/> Slanted lift chain → arranged parallel (P mast)
----------	--

<b>B</b>	Adopt VFD (Vacuum Fluorescent Display)
(Interchangeable installation with panel Ass'y)	
<ul style="list-style-type: none"> <li>● 10-step battery discharge indication</li> <li>● Time length of hour meter indication key when it is ON (actual operation time is OPT)</li> <li>● Canceled battery electrolyte level display</li> <li>● Altered speed indication (actual speed / converted speed)</li> <li>● Mono-blocked slow speed (turtle) S/W and mode S/W (sheet type switch)</li> </ul>	

<b>E</b>	Valve potential for the lift → micro S/W
----------	--

: Initial lot trucks are not featured. (Will be featured accordingly)

<b>L</b>	Change of the head guard ceiling figure
----------	---

<b>G</b>	EPS controller (change the FET parallel number)
FBR 14 - 30	

<b>H</b>	Small-sized contactor (small-sized coil)
----------	--

<b>I</b>	Commonized MPU fuse
Main fuse (325A), EPS fuse (40A)	

<b>N</b>	<input type="checkbox"/> Plasticized battery plug cover (front loading)
----------	---

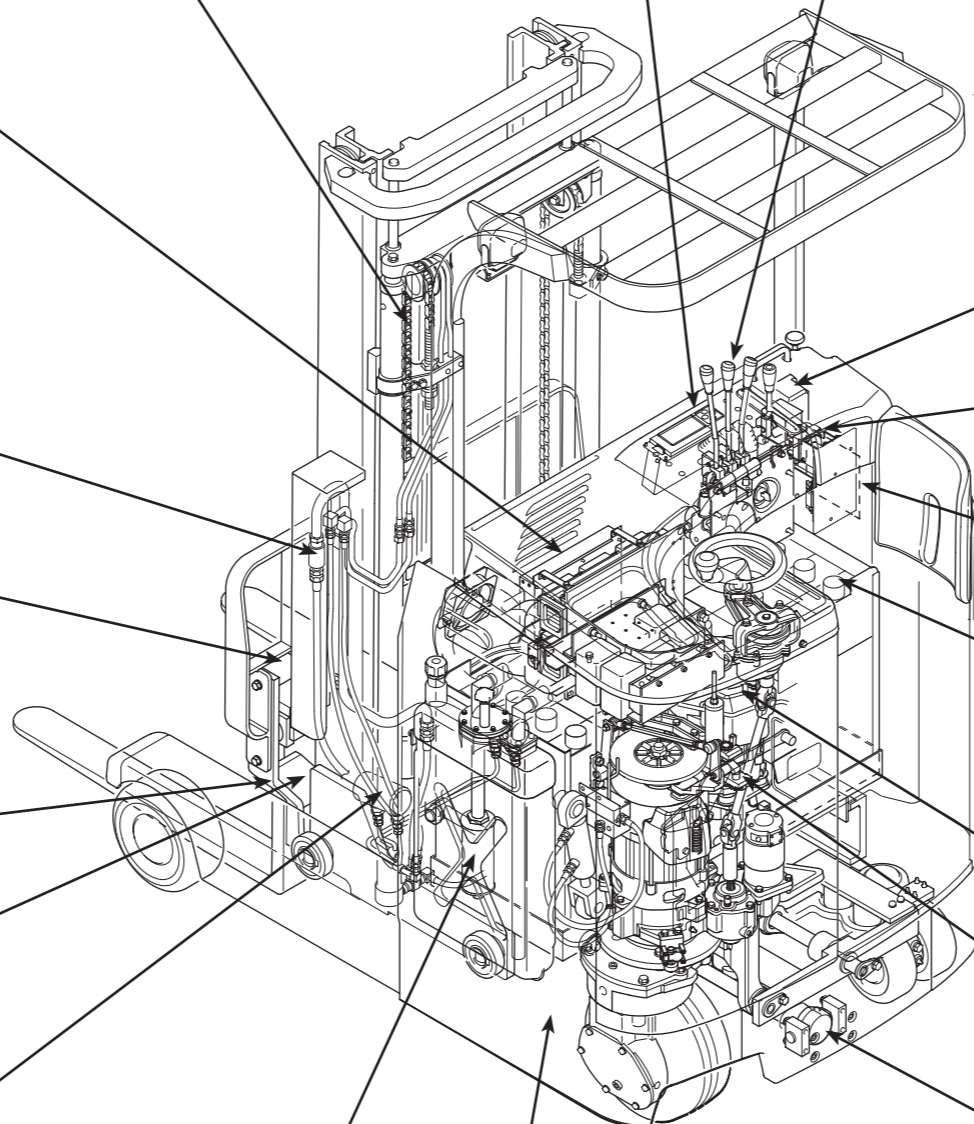
<b>J</b>	Change the battery electrolyte level sensor position
FBR9 - 18	

<b>D</b>	Abolish the hydraulic motor sensor
----------	------------------------------------

<b>P</b>	<input type="checkbox"/> Sheet metal disc brake
----------	---

<b>V</b>	<input type="checkbox"/> Change the reach cylinder diameter
FBR9-18 : φ 50/φ 25 / φ 45/φ 25 (inside diameter / rod diameter)	
FBR20-30 : φ 50/φ 25 / φ 50/φ 30 (inside diameter / rod diameter)	

<b>O</b>	<input type="checkbox"/> Commonized frame Comp. Material
Front and side material etc.	



## 1-2. What's new in FBR-75 (CAN-BUS control)

 : Initial lot trucks are not featured. (Will be featured accordingly)

**C** Abolish the display control board

- Charing passage indicator addition
- Display board abolition
- Waterproof strengthening of resin panel

**E** Change the charge passage display

- LED→ display

**G** Charge display (option)

- It displays the charge by the electric rate and the amount of the charge per 1 kW.

**B** Change the MPU board

- FB and FBR are shared.

**K** Improve the waterproof connector application location

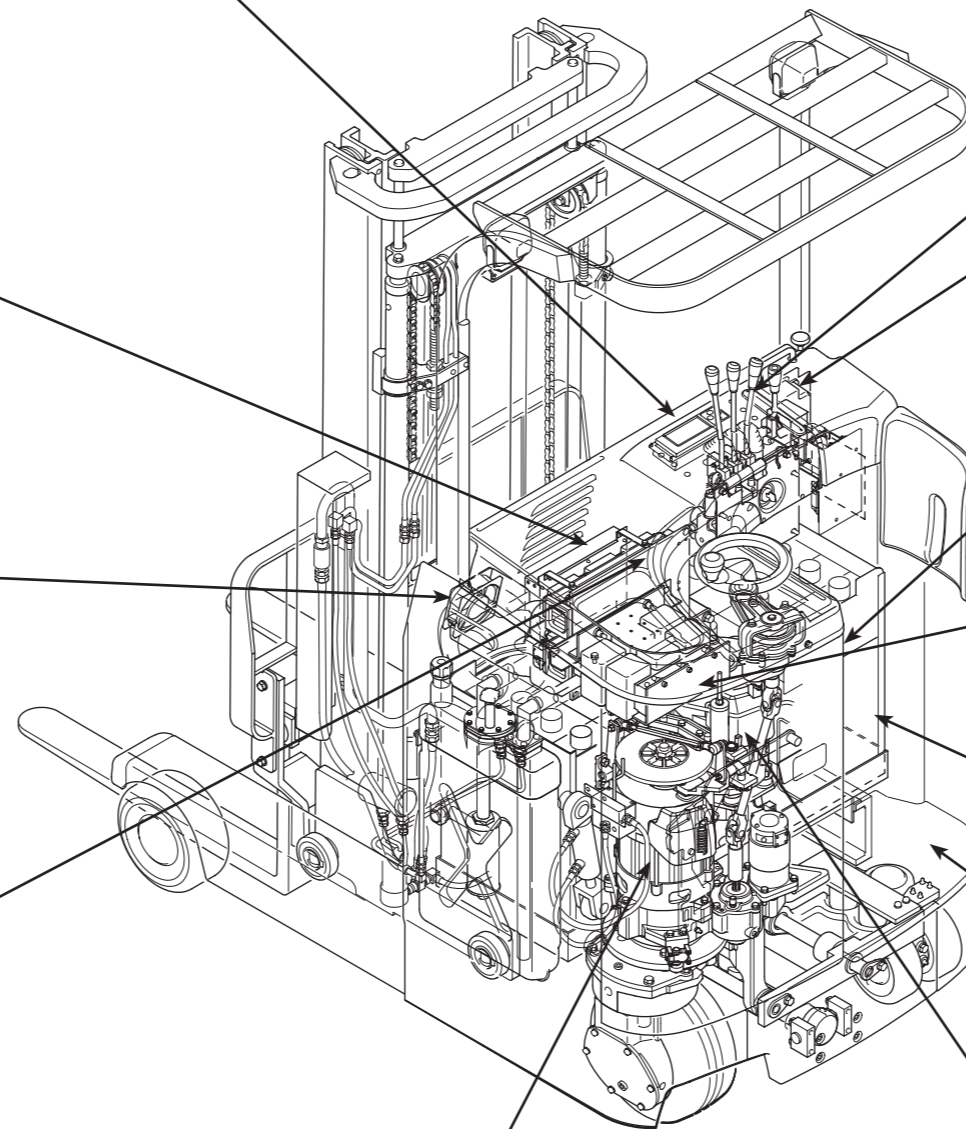
- The connector is changed to the waterproof type.

**J** Fan decrease

- FBR10H/13H/14-18 CS/FCS

**A** Adopt CAN system

- Decrease in wiring by CAN-BUS system adoption
- Message addition



**L** Mode change switch waterproof strengthening

- Apply on the surface coating (same to HT coating)

**H** Function integration

- Display board, Microcomputer charger and EPS are integrated.

**M** Expansion of charge plug window

- The window is expanded to prevent the finger stuff etc. Detaching the charge plug has been improved.

**D** Change of charger switch

- Charge passage LED is abolished.

**I** Review the transformer capacity

- Improvement of transformer capacity and shortening at charging time

**O** Improve the CS specification

- Waterproof cover addition
- Waterproof strengthening

**N** Change the battery roller base

- The work of the battery maintenance is improved by adjusting the roller to 2 pieces, and enlarging space required for installation with the case.
- Waterproof strengthening

**F** Adopt OIS (Operation Interlock System) function

- It is the travel and loading system that cannot work if the operator does not correctly sit on the seat.

**P** Change of travel motor winding

- Weight reduction of coil stater (copper wire part)

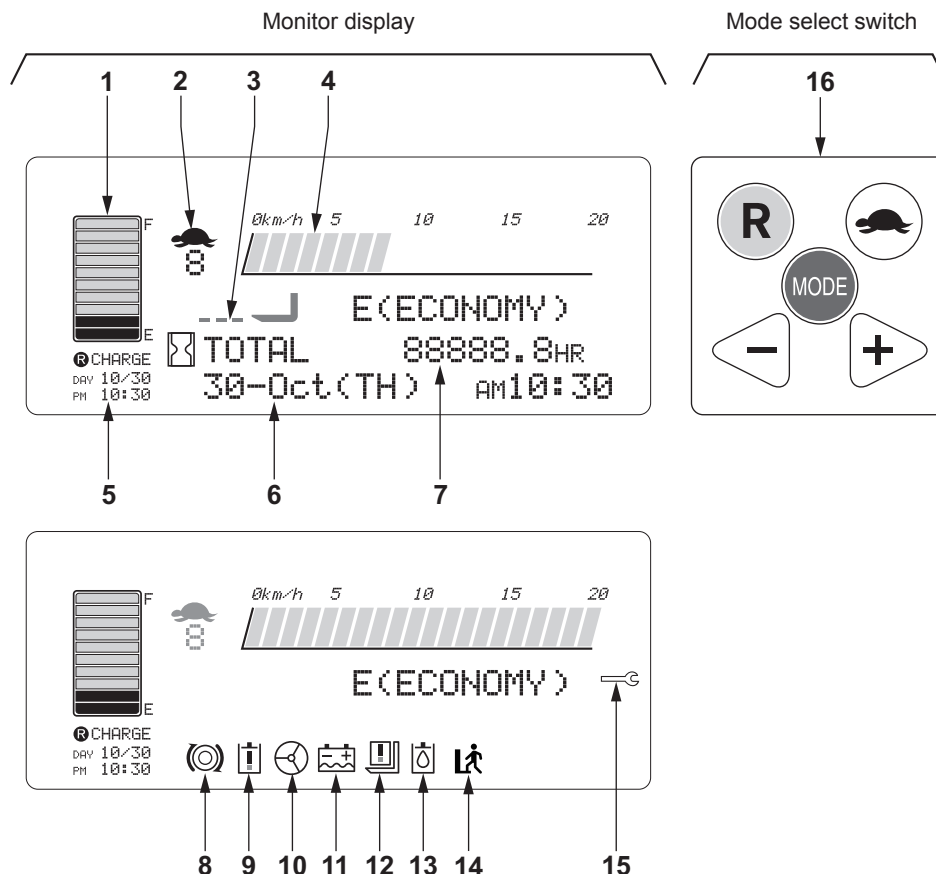
**Q** Adopt the EPS sensor water Drain hole

- 4.2 holes are added.

# 2. Adjustment of SICOS-AC

## 2-1. Explanation of the monitor display

### 2-1-1. Indicator panel




1. Battery discharge indicator
2. Slow speed mode monitor (Turtle mark)
3. Fork horizontal indicator (Option)
4. Travel speed meter
5. Reserve charge indication (Option)
6. Date and time (Calendar and clock)
7. Hour meter
8. Safety monitor for travel circuit
9. Safety monitor for hydraulic circuit
10. Safety monitor for steering circuit
11. Safety monitor for battery electrolyte level (Option)
12. Safety monitor for overloading (Option)
13. Safety monitor for hydraulic oil (Option)
14. Safety monitor for for OIS (Operator Interlock System) ※CAN-BUS control
15. Service icon
16. Mode select switch

#### NOTE

Icons of 8 to 15 shown in the illustration are displayed for the explanation. It is not actual indication. They are displayed when abnormalities are occurred.

## 2-1-2. Indication of display

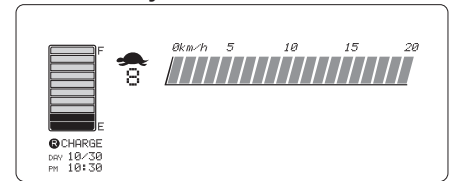
Turn on the key switch.

The self-diagnosis function checks the control system and display "MONITORING OK" when no problems are found. Icon of  "Read operator's manual" is flashed three times for warning to the operator.

Then, the normal screen is displayed.

If any abnormalities are detected, the error message is displayed. If the message is too long or some abnormalities are occurred at the same time, they are scrolled from right to left alternatively.

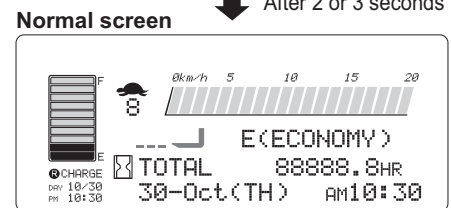
When the key switch is turned on.



↓ After 0.5 seconds



↓ After 2 or 3 seconds



121T187E

 **NOTE**

If traveling or hydraulic operation is done while system checking for the first 3 or 4 seconds after turning on the key switch, the normal screen is displayed immediately.

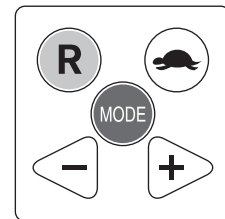
 **CAUTION**

Contact to your local Nichiyu dealer if the error message is displayed.

## Mode select switch

 **NOTE**

If travel/hydraulic operation is done while the mode setting, the display is returned to the normal screen.



121T188

### Setting screen by one touch operation


Push  button.



**Reserve charge screen**  
● Set the starting time of battery charge.

(This screen is displayed if the optional built-in charger is equipped.)

●●● Refer to the section of the reserve charging on FBR-75 OPERATOR'S MANUAL or WORKSHOP MANUAL.

Push  button.  
(Release within 3 seconds.)



**Mode select screen**  
● Slow speed mode setting  
● Travel mode setting  
● Hour meter / odometer selection  
● Display mode setting  
● Neutral (Accelerator OFF) regeneration mode setting



●●● Refer to each setting section.

Push  button  
formore than 3 seconds.



**Date / time setting screen**  
For setting of date and time.

●●● Refer the page 18 for details.

Push one of  or .



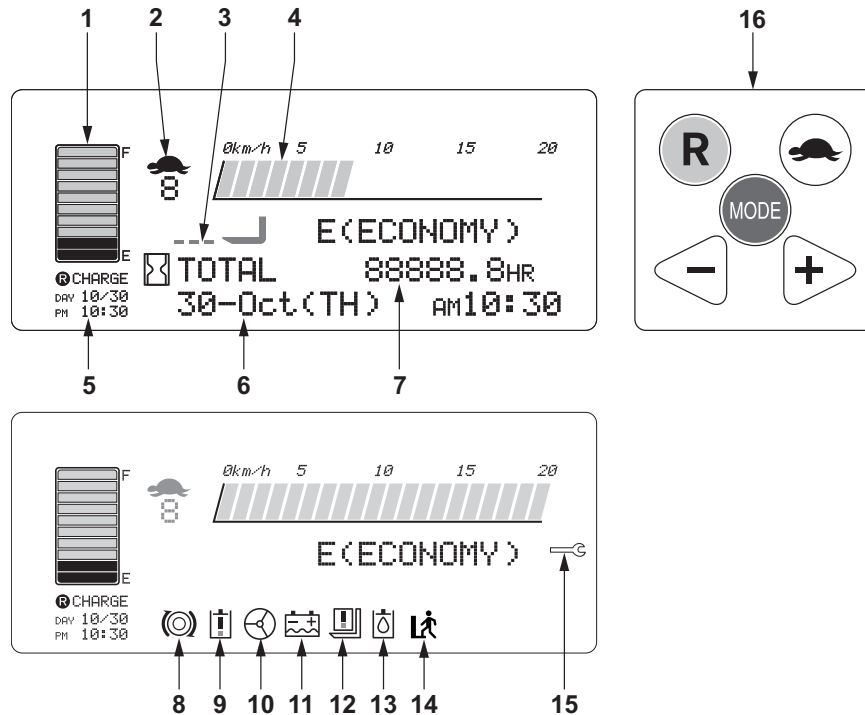
**Hour meter screen**  
● Reading of hour meter counter (Total, Travel and Hydraulic)

●●● Refer the page 7 for details.



## 2-1-3. Function of display

This forklift truck has the self-diagnosis function.



121T347E



NOTE

Icons of 8 to 15 shown in the illustration are displayed for the explanation. It is not actual indication. They are displayed when abnormalities are occurred.

### 1. Battery discharge indicator

The battery discharge indicator shows the discharged condition of the battery.

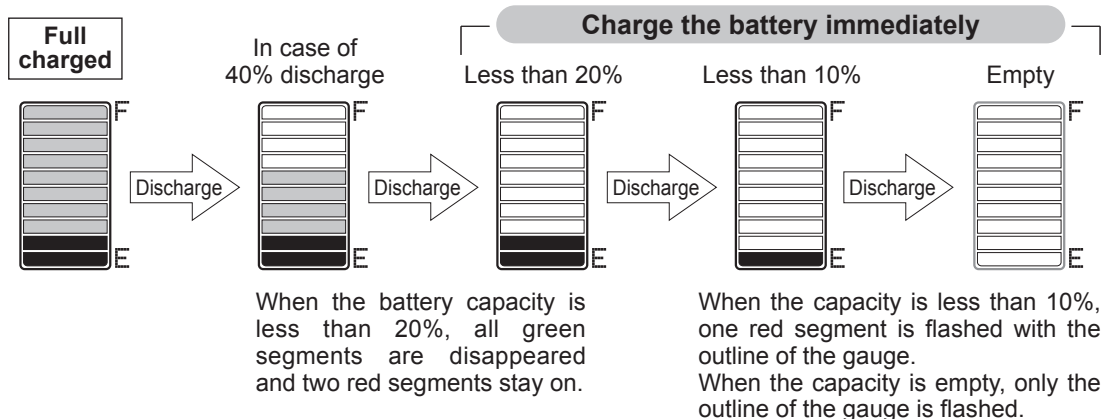


CAUTION

**Do not over-discharge.**

The battery life can be shortened by over-discharging.

Charge the battery as soon as possible when all green segments are disappeared.



121T190E

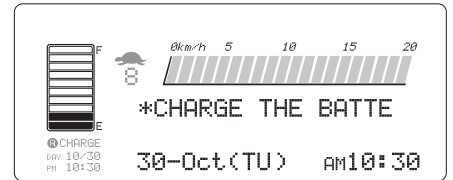
**●Over discharge lift lock (Option)**

When all green segments are disappeared and two red segments are lit, the lift speed is reduced by half.

At the same time, "※CHARGE THE BATTERY※" message appears on the screen.

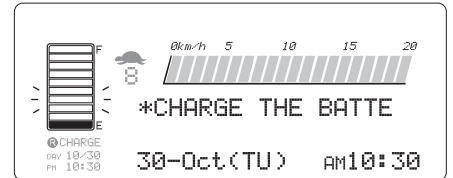
When the truck is continued to use, only one red segment is started to flash and the lift function is interrupted.

※ Standard equipment for EEC.



Two red segments are lit.

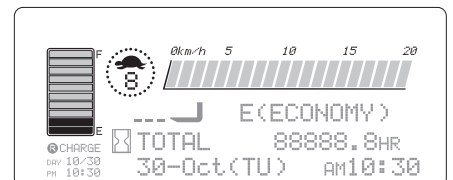
↓ After 10 minutes.



One red segment is started to flash and lift function is interrupted.

**2. Slow speed mode monitor (Turtle mark)**

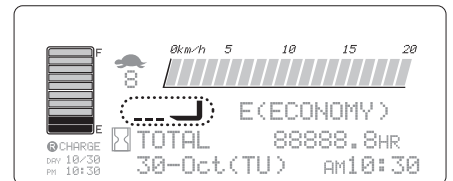
When the turtle button is pushed, the turtle mark is indicated on the screen with the preset speed.



121T192E

**3. Fork horizontal indicator (Option)**

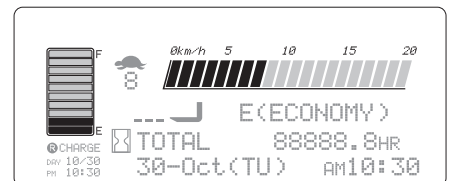
This mark is indicated when the fork is horizontal and possible to use the laser pointer.



121T193E

**4. Speed meter**

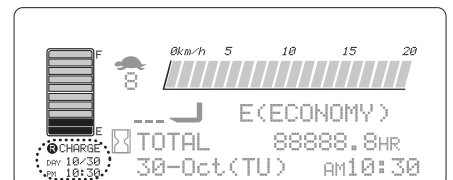
The traveling speed is displayed on the screen.



121T194E

**5. Reserve charge indication (Option)**

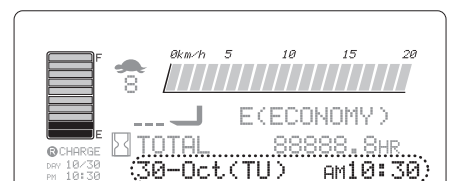
The reserved date and time to start charging the battery is displayed. Refer the section of "Battery and charger" on FBR-75 OPERATOR'S MANUAL or WORKSHOP MANUAL for details.



121T195E

**6. Date and time (Calendar and clock)**

The current date and time are displayed. If the "MODE" button is pushed for more than 3 seconds, the display is changed to the setting screen. Refer the page 18 for details.



121T196E

## 7. Hour meter

The hour meter shows the total hours of turning on the key switch.

(The actual operating hours can be displayed as option.)  
It is useful to know the total operating hours for the daily job management and scheduling of the periodical inspection.

When pushing " $\ominus$ " or " $\oplus$ " button, each individual hours for travel, hydraulic and total are displayed for 5 seconds.

The normal screen and hour meter screen are changed by turn by pushing " $\ominus$ " or " $\oplus$ " button.  
After 5 seconds, the normal screen is displayed.

The odometer can be displayed in the normal screen instead of hour meter. Refer the meter mode setting in the setting mode section.



**The hour meter screen is returned to the normal screen even less than 5 seconds by operating traveling or hydraulic function.**

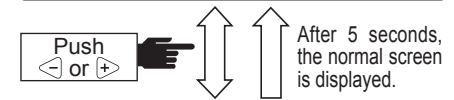
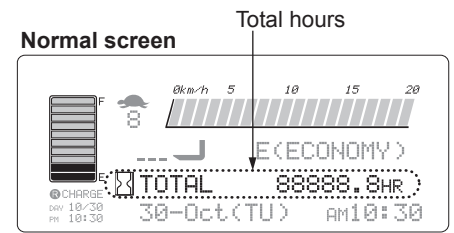
The load weight gauge (option) or odometer can be displayed instead of the hour meter.

Refer the meter mode setting section at the page 21.

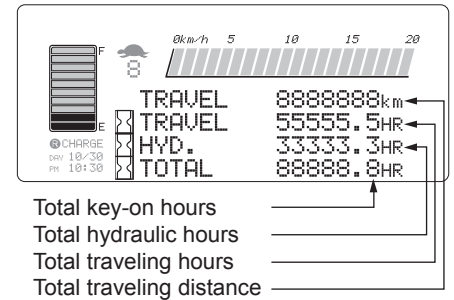
- When the screen displays the odometer, the word of "TRAVEL" is flashed while travelling.
- When the screen displays the load weight, the word of "LOAD" is displayed and flashed while operating hydraulic and for 5 seconds after operation.  
The displayed figure is changing during the flashing.  
Read the figure after stopping to flash to get the correct weight.

## 8. Safety monitor for travel circuit

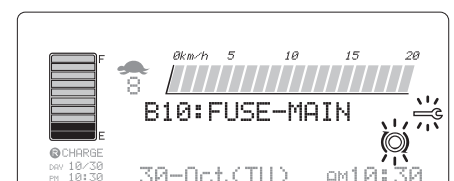
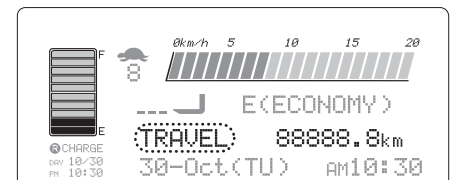
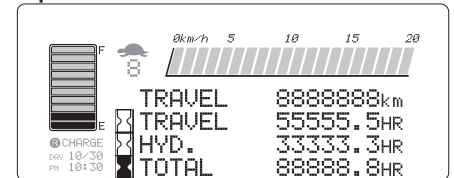
When fault is detected in the travel circuit, the travel icon flashes and the presumed defective part name is displayed.



### Hour meter screen



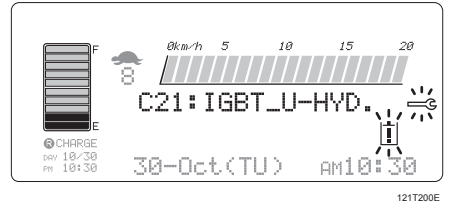
### Option



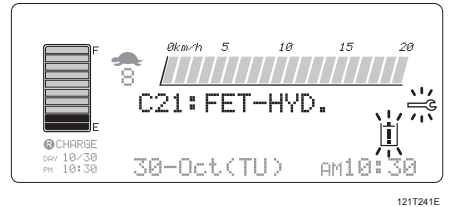
### 9. Safety monitor for hydraulic circuit

When fault is detected in the hydraulic circuit, the hydraulic icon flashes and the presumed defective part name is displayed.

#### ● IGBT and FET control

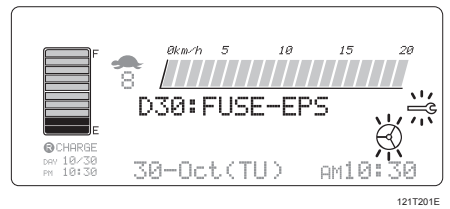


#### ● CAN-BUS control



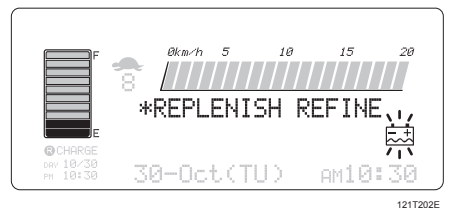
### 10. Safety monitor for steering circuit

When fault is detected in the power steering circuit, the steering icon flashes and the presumed defective part name is displayed.



### 11. Safety monitor for battery electrolyte level (Option)

When the electrolyte level is lower than the specific level, the battery icon flashes and " \*REPLENISH REFINED WATER FOR BATTERY \* " message is displayed.



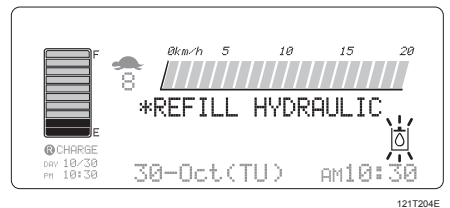
### 12. Safety monitor for overloading (Option)

When overloaded, the load icon flashes and " \*REDUCE THE LOAD \* " message is displayed on the screen.



### 13. Safety monitor for hydraulic oil (Option)

If the hydraulic oil level is low, the icon is flashed and the message of " \*REFILL HYDRAULIC OIL \* " is displayed.



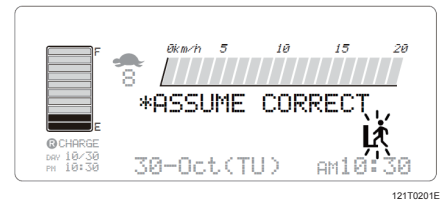
**NOTE**

The hydraulic oil level sensor detects the oil level for 2 seconds after turning on the key switch. So, the fork must be lowered on the ground before turning on the key switch. Otherwise, the warning message of " \*REFILL HYDRAULIC OIL \* " may be displayed even the quantity of oil is normal. If the warning message is shown, lower the fork on the ground, turn off the key switch once, and turn on again. If the warning message is disappeared then, the oil level is normal.

## 14. Safety monitor for OIS (Operator Interlock System)

### CAN-BUS Control

This system interlocks traction and hydraulic functions if the operator does not stand on the floor plate correctly. If the operator leaves the driver's compartment while operating the truck, the OIS icon flashes to warn to the operator. If that situation is continued for more than 2 seconds, the buzzer beeps and all functions of traveling and hydraulics are interlocked. If the operator stands on the floor plate correctly within 2 seconds, the interlock does not activate and traveling and hydraulic functions are not interrupted.

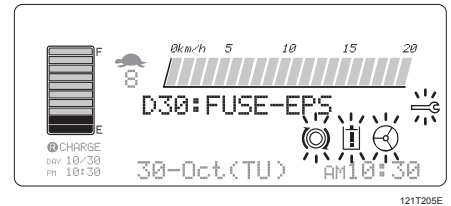


#### NOTE

- Even if the interlock is activated, the power for the motor is shut off but the brake is not applied. So, the truck keeps coasting. If the interlock is activated on a slope, the truck may be rolled back.
- When the interlock is activated, the hydraulic function will be started after 1 second if the operator stands on the floor plate with operating a hydraulic lever.

## 15. Service icon

The service icon warns the fault of the forklift truck to an operator. If any faults are detected, the spanner mark is flashed and the presumed defective part name is displayed. If some problems are occurred at the same time, each part name is scrolled alternatively for every 5 seconds.



### CAUTION

- If the next fault is detected, all travelling, hydraulics and power steering functions are shut down.

#### ■ IGBT / FET control

B11 : IGBT\_U-TRAVEL

B12 : IGBT\_V-TRAVEL

B13 : IGBT\_W-TRAVEL

C21 : IGBT\_U-HYD.

C22 : IGBT\_V-HYD.

C23 : IGBT\_W-HYD.

※FAIL CURRENT-TRAVEL※

※FAIL CURRENT-HYD※

※FAIL OPERATION※

#### ■ CAN-BUS control

B11 : FET-U-TRAVEL

B12 : FET-V-TRAVEL

B13 : FET-W-TRAVEL

C21 : FET-U-HYD.

C22 : FET-V-HYD.

C23 : FET-W-HYD.

※FAIL CURRENT-TRAVEL※

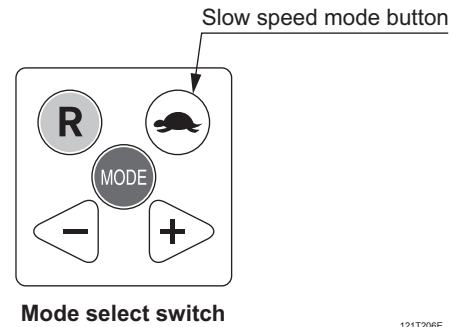
※FAIL CURRENT-HYD※

※FAIL OPERATION※

- All , , ,  buttons are invalid while displaying these messages.

## 16. Mode select switch

Change the screen to each mode by pushing these buttons.



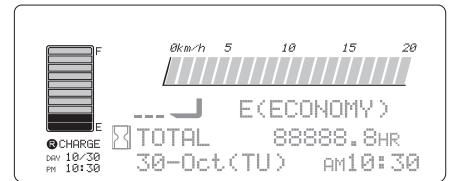
121T206E

### Slow speed mode button

The slow speed mode is activated by pushing this button.

#### 1 Normal traveling mode (When the slow speed button is off)

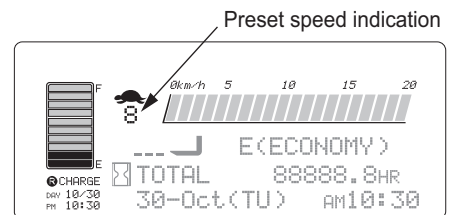
The turtle icon () is not displayed.



When the slow speed button is off  
(Turtle mark is not displayed)

#### 2 Slow speed mode (when the slow speed button is on)

The turtle icon and preset speed are displayed on the screen.



When the slow speed button is on  
(Turtle mark is displayed)

121T207E

- The maximum travel speed (normal mode) and preset speed (turtle mode) can be switched alternately by pushing the turtle button.

## 2-1-4. Various kinds of mode selection

- [1] Reserve charge setting
- [2] How to set the date and time
- [3] Slow speed setting
- [4] Travel mode setting
- [5] Meter mode setting
- [6] Display mode setting
- [7] Neutral (Accelerator OFF)  
regeneration mode setting

### CAUTION

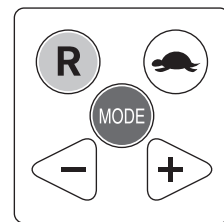
- These settings are invalid while traveling or depressing the brake pedal.
- If traveling or hydraulic operation is done while setting, the display is returned to the normal screen immediately.

When pushing the "MODE" button, the mode selection screen is displayed. If pushing the "MODE" button again, the normal screen is displayed again.

### NOTE

When setting the mode of next [1] to [5], each button works as below.

- "◀" and "▶" buttons : Move the cursor to select the value.
- "R" button : Move the cursor to the next item.
- "MODE" button : Back the cursor to the previous item.



Mode select switch

121T188



## [1] Reserve charge setting

### 1. 48V capacity indication

#### <5-step indication (FBR-70)>

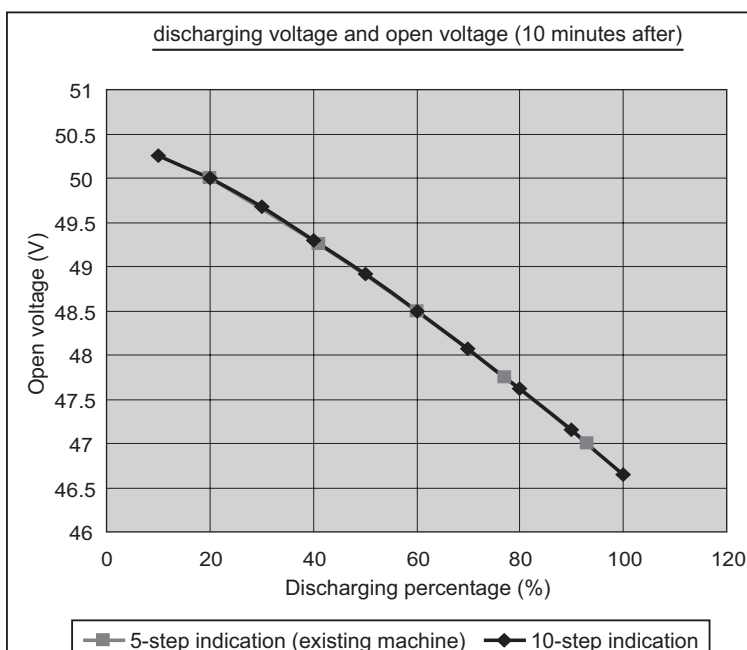
FBR-70 is not completely in proportion to discharging capacity because it divides voltage by 0.75V.

Discharging percentage (%)	Terminal voltage (V)
20	50
41	49.25
60	48.5
77	47.75
93	47

#### <10-step indication (FBR-75)>

It sets dividing voltage to be in proportion completely to the capacity.

Discharging percentage (%)	Terminal voltage (V)
10	50.25
20	50
30	49.67
40	49.3
50	48.91
60	48.5
70	48.07
80	47.62
90	47.15
100	46.65



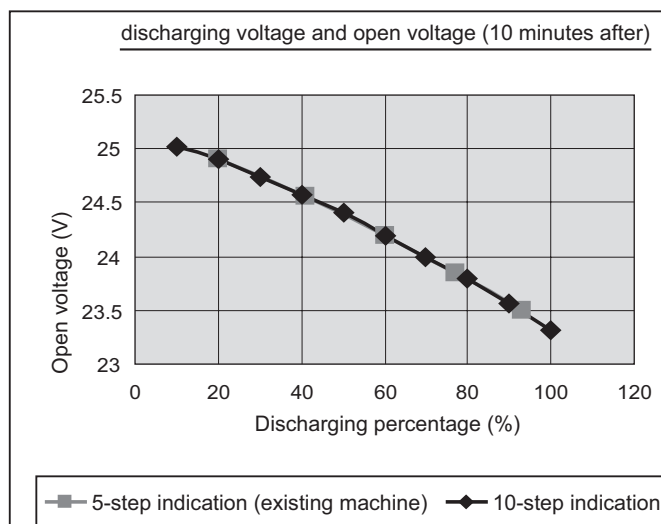
## 2. 24V capacity indication

### <5-step indication (FBR-70)>

Discharging percentage (%)	Terminal voltage (V)
20	24.9
41	24.55
60	24.2
77	23.85
93	23.5

### <10-step indication (FBR-75)>

Discharging percentage (%)	Terminal voltage (V)
10	25.02
20	24.9
30	24.74
40	24.57
50	24.4
60	24.2
70	24
80	23.79
90	23.56
100	23.32



The graph below shows the relation between the electrical discharge rate and the capacity.

The display disappears in 93% or less in this graph at five-step.

It seems to light one between 93% and 100% at the electrical discharge rate at ten-step display.

Actually, red lights when the electrical discharge rate reaches 93% at five-step display.

In a word, red lights when it reaches 80% from 75 types though red lights in FBR-70 when the electrical discharge rate reaches 93%.

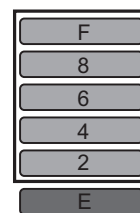
Over-discharging lift interrupt option is also similar.

The lift speed becomes a half velocity at the same time as red's lighting, and it limits earlier than 70 types.

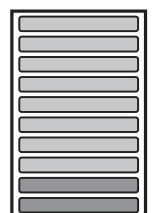
When a red lighting becomes one, the lift is stopped.

In this case, the last one red assumes the state of blinking, and also blinks the frame at the same time.

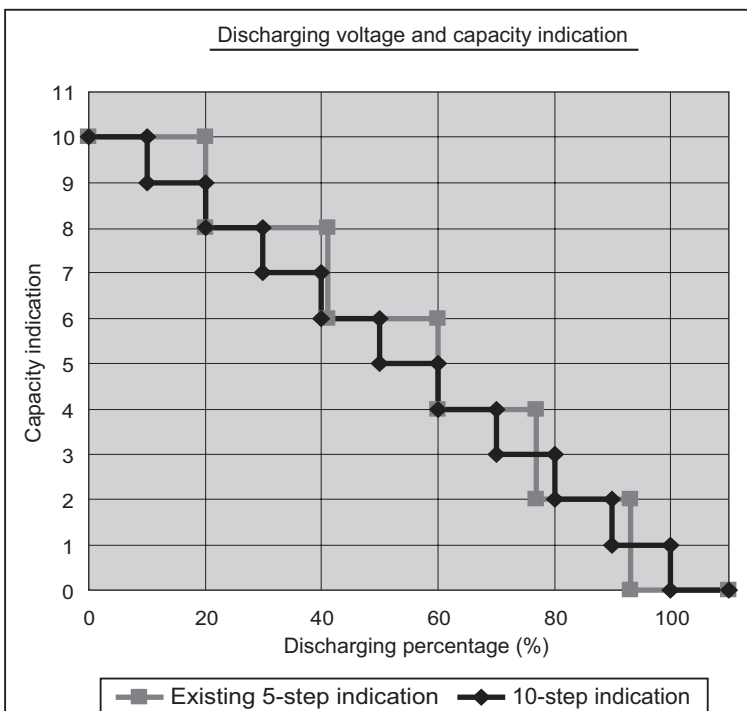
Only the frame blinks after turning off the last one.



FBR-70



FBR-75



# 1. FBR-75 (CAN-BUS Control)

## <Charging passage indicator>

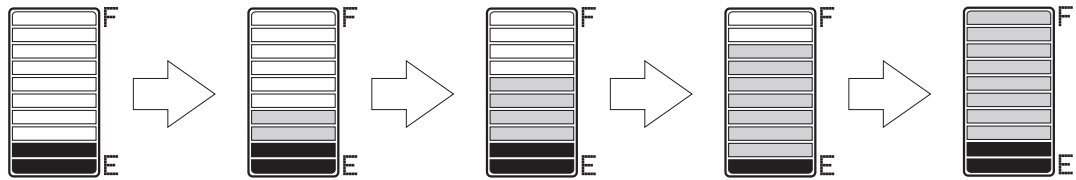
Microcomputer charger is changed by adopting the CAN transmission.

As a result, LED of the charger panel that the charging passage indicator is abolished, and the charging passage will be shown as substitution on the monitor display.



**The monitor display is turned on that either of the automatic, the equalizing or the reservation charge begins, and it begins to indicate the charging passage with the capacity gauge of the battery.**

### ●Indication of charging passage



(1) Starting voltage of charge in which starting charge is 53V/26.32V or less.

(2) Middle voltage of charge is 53V-55V/ 26.32V-27.31V.

(3) Middle voltage of charge is 55V-58V/ 27.31V-28.8V.

(4) The voltage after detecting pole changing point is 58V/28.8V or more.

(5) Charge completion The electromagnetic switch is in the state of turning off.

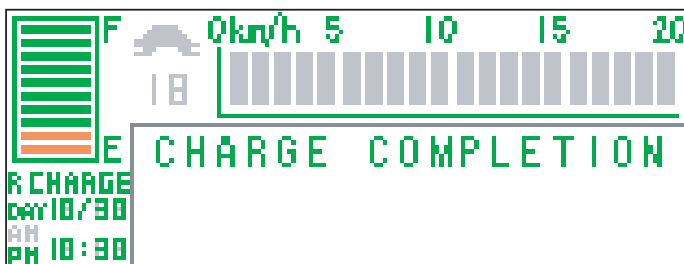


**The charge is discontinued, and the monitor display is turned off when blacking out while charging.**

- The charge is restarted when the power supply returns within one hour, and the charging passage is indicated.
- When the power supply doesn't return within one hour, the charge is not restarted.

The AC power supply is turned off to erase the indication or the switch is pushed.

### ●Charge completion



221T110