CIT-MR-0

SPECIFICATIONS FOR M-800-V M/E REMOTE CONTROL SYSTEM

SHIPYARD	:	KAWASAKI HEAVY INDUSTRIES, LTD.
SHIP NO.	:	1736
RULE	:	ABS as NK
SHIPOWNER	:	
SHIP KIND	:	
CUSTOMER	:	KAWASAKI HEAVY INDUSTRIES, LTD.
ORDER NO.	:	
MAIN ENGINE	:	KAWASAKI-MAN B&W 7S60ME-C8.2
MCR	: 89.0	min^{-1}, rpm
NCR	: 84.0	min^{-1}, rpm
OVERSPEED	: 97	min^{-1}, rpm
TEETH NO. OF FLY WHEEL	: 68	tooth
REVO. IND. MAX. RANGE	: 120	min^{-1}, rpm

Nabtesco Corporation
MARINE CONTROL SYSTEMS COMPANY
ENGINEERING DEPARTMENT

REV. MARK	NOTE		DATE	DESIGNED		CHK.	APVD.
b×3	キZH：14/, 15/ニ訂正 船主殿コメントニヨル	C	2017 11/30	KI	間嶋	榊原	竹下
ax7	キZH：14/, 27/ニ訂正 船主殿コメントニヨル	C	2017 5/16	間嶋	—	榊原	竹下
—		—	2016 11/17	M.F	間嶋	榊原	竹下

1 General

The engine control system (ECS : supplied by engine builder) provides the performances of reversing, starting, stopping and speed setting of the main engine, electrically from the wheelhouse, control room and engine side by means of the telegraph transmitter, telegraph receiver or maneuvering dial.

This system supplies program control during navigation zone and telegraph handle (maneuvering dial) position signal to ECS.

There is provided with a safety system, which automatically slows down or automatically shuts down the main engine at emergency such as abnormal condition of the main engine.

A manual emergency trip device is provided to be able to trip the main engine for emergency such as failure of the remote control system.

Furthermore, in case of control room and local control, telegraph transmitter on the wheelhouse is used as normal engine telegraph.

2 Maneuvering method

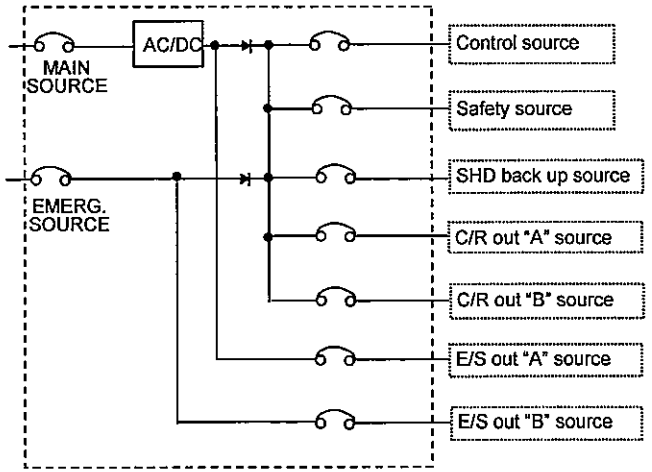
	MANEUVERING METHOD	SPEED CONTROL METHOD	SAFETY SYSTEM
WHEEL HOUSE	Automatic control by means of telegraph transmitter (Communication signal) to ECS	Speed control signal is supplied to ECS from telegraph transmitter (Communication signal) to ECS	Manual emergency trip Automatic emergency trip Automatic emergency slow down
C/R CONTROL	Automatic control by means of telegraph receiver Only supply the telegraph receiver position signal (4 – 20mA) to ECS	Speed control signal is supplied to ECS from telegraph receiver Only supply the telegraph receiver position signal (4 – 20mA) to ECS	Manual emergency trip Automatic emergency trip Automatic emergency slow down
C/R BACK UP CONTROL	Automatic control by means of telegraph receiver Only supply the telegraph receiver position signal (4 – 20mA) to ECS	Speed control signal is supplied to ECS from telegraph receiver Only supply the telegraph receiver position signal (4 – 20mA) to ECS	Manual emergency trip Automatic emergency trip Automatic emergency slow down
LOCAL	Automatic control by means of maneuvering dial Only supply the maneuvering dial position signal (4 – 20mA) to ECS	Speed control signal is supplied to ECS from maneuvering dial Only supply the maneuvering dial position signal (4 – 20mA) to ECS	Manual emergency trip Automatic emergency trip

3 Electric Source

a) Control room power supply unit

Main source :
AC220V 60Hz 1φ
Power consumption :
Normal 230VA
Max. 360VA

Emergency source :
DC24V Battery
Power consumption :
Max. 200W

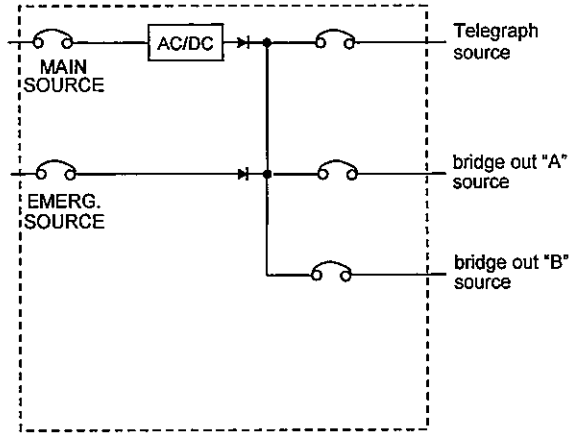


PSC-28 UNIT

b) Wheelhouse power supply unit

Main source :
AC220V 60Hz 1φ
Power consumption :
Normal 140VA
Max. 290VA

Emergency source :
DC24V Battery
Power consumption :
Normal 1W
Max. 250W



PSB-24 UNIT

4 Change-over of Control Position (Supplied by ECS)
W/H – C/R – LOCAL

	Local illuminate P.B. switch		C/R illuminate P.B. switch		Wheelhouse confirm P.B. switch	Indicator lamp			Sound	Control position
	LOC	C/R	C/R	W/H		LOC	C/R	W/H		
LOCAL						○				LOCAL
↓		□				○	◎		≪	〃
C/R			□				○			C/R
C/R							○			C/R
↓				□			○	◎	≪	〃
W/H					□			○		W/H
W/H								○		W/H
↓			□				*◎		*≪	C/R
C/R							○			〃
C/R							○			C/R
↓	□					*◎			*≪	LOCAL
LOCAL						○				LOCAL

□: Push button switch operation
○: Indicator lamp continuous lighting
◎: Indicator lamp flickering
*◎: Indicator lamp flickering for 2 seconds
≪: Telegraph audible equipment sound
*≪: Telegraph audible equipment sounding for 2 seconds

Change-over of Control mode (Operate in case of C/R control only)

	C/R Control mode changeover switch	Indicator lamp				Sound	Control position
		LOCAL	BACK UP	C/R	W/H		
C/R ↓ BACK UP	NORMAL			O			C/R
	BACK UP		◎	O			C/R BACK UP
BACK UP ↓ C/R	BACK UP		◎	O			〃
	NORMAL			O			C/R

O : Indicator lamp continuous lighting
◎ : Indicator lamp flickering (Indicate on C/R only)

Note 1. Control position change-over interlock:
Change-over of control position from the control room to the wheelhouse can not be made in the following cases.

① The starting air main valve is in the position other than "SERVICE".

Note 2. Alarm of "IMPERFECT W/H CONTROL" is given when wheelhouse control is ordered under below abnormal conditions.
Ordering the wheelhouse control, if one and more of following conditions are occurred, this alarm is given.

And during the wheelhouse or control room control, if one and more of following conditions are occurred, indication of "W/H CONTROL CONDITION" on CDP unit indicates "IMPERFECT".

① The starting air main valve is in the position other than "SERVICE".

Note 3. In case of control position change-over to wheelhouse from control room, operate the telegraph transmitter so that the indication of "HANDLE MATCH" is displayed on BDP unit. (for the purpose of restraining speed fluctuation of the main engine as low as possible during transition).

And in case of control position change-over to control room from wheelhouse, operate the telegraph receiver so that the indication of "HANDLE MATCH" is displayed on CDP unit. (for the purpose of restraining speed fluctuation of the main engine as low as possible during transition).

In case of control position change-over to local from control room, operate the maneuvering dial in local so that the indicator lamp "HANDLE MATCH" in LOP lights on (for the purpose of restraining speed fluctuation of the main engine as low as possible during transition).

And in case of control position change-over to control room from local, operate the telegraph receiver so that the indicator lamp "HANDLE MATCH" in control room lights on (for the purpose of restraining speed fluctuation of the main engine as low as possible during transition).

4.1 Take command

In case of the emergency condition such as the failure of remote control system, the control position can be changed-over to C/R or LOCAL by operating the "TAKE COMMAND" push button in control room and local.
The "TAKE COMMAND "push buttons are connected directly to the ECS, which will change over to the particular control station immediately the corresponding push button is operated.
When the push button is operated, the alarm of "TAKE COMMAND" is given, and the lamp of control position might not display correct position because of failure condition of remote control system.

The above condition is described as follows:

Control position	Indicator lamp			Local Take Comm -and	C/R Take Comm -and	Remark
	LOC	C/R	W/H			
W/H			○			
LOCAL	○			□		Warning
LOCAL	○					
C/R		○			□	Warning
C/R		○				
LOCAL	○			□		Warning
LOCAL	○					
W/H			○			
C/R		○			□	Warning
C/R		○				

○ : Indicator lamp continuous lighting
◎ : Indicator lamp flickering
≫ : Telegraph audible equipment sound
□ : Push button switch operation
Warning : Alarm is happened

5 Control system

5.1 The engine control system (ECS : supplied by engine builder) provides performances of reversing, starting, stopping and speed setting of the main engine.
Please refer to the specification of ECS (engine control system).

5.1.1 LOAD PROGRAM (Wheelhouse and C/R normal control)

a) Acceleration to navigation speed
By putting the telegraph transmitter (receiver) into more than load program starting position of NAV. FULL, it is gradually accelerated more than that position as far as equivalent to the telegraph transmitter (receiver) position due to the program loading up mechanism.
This program of loading up mechanism has 2 stages in wheelhouse and control room normal control,

The program indication of "LOAD UP" is displayed during loading up program

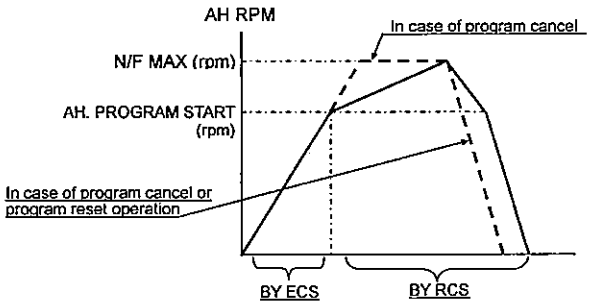
b) Deceleration from navigation speed (Wheelhouse and C/R normal control)

By operating the telegraph transmitter (receiver) from more than load program starting position of NAV. FULL for reducing, the main engine is gradually decelerated as far as the load program starting position due to the program loading down mechanism, and it is instantly decelerated less than that position as far as equivalent to the telegraph transmitter (receiver) position.

The "PROGRAM"indication of "LOAD DOWN" is displayed during loading down the program.
In case that the telegraph transmitter (receiver) is operated into less than program reset level (include stop or astern side), the program loading down mechanism does not operate.

c) Program cancel
By pushing the "PROGRAM BY-PASS" push button switch (momentary type) provided in the wheelhouse and control room, the indicator lamp turns on and the program loading up/down mechanism does not operate even in case that the telegraph transmitter (receiver) is operated to the load program position.

Time program :



5.1.2 LIMITED SPEED (wheelhouse control only)
Limit of setting revolution

The upper limit of setting revolution in the wheelhouse control is limited depend on the lower setting value, which is chosen between the speed order by telegraph receiver position in the control room and the setting value by tenkey on CDP unit in control room.

The main engine can be accelerated no farther even by putting the telegraph transmitter more than the position equivalent to limited revolution. At the same time, the indication of "LIMITED SPEED" is displayed.

5.1.3 Control system monitoring function

In each case of the following conditions, the alarm of "CONTROL SYSTEM ABNORMAL" is given, and the main engine maintains the existing state of things and the each cause is displayed on the CDP unit.

① Micro-computer CPU hard for control system abnormal.
② Communication abnormal.
③ Telegraph transmitter encoder disconnection.
④ Telegraph receiver encoder disconnection.
⑤ Revolution signal (for control system) abnormal.

The "Major Failure" or the "Minor Failure" is displayed on the BDP & CDP unit by the kind of abnormal cause.

When the abnormal cause is backed up by SUB SYSTEM, "MINOR FAILURE" is displayed.

When both MAIN and SUB SYSTEM are abnormal condition, "MAJOR FAILURE" is displayed.

- The cause of "Minor Failure"
  ① Either Main or Sub Communication abnormal.
  ② Either Main or Sub Revolution signal (for control) abnormal.

- The cause of "Major Failure"
  ① Micro-computer CPU hard for control system abnormal.
  ② Both Main and Sub Communication abnormal.
  ③ Telegraph transmitter encoder disconnection.
  ④ Telegraph receiver encoder disconnection.
  ⑤ Both Main and Sub Revolution signal (for control) abnormal.

5.1.4 C/R Back up control

In case of the emergency condition such as the failure of remote control system, C/R back up control is available.
During the "BACK UP" control, the command signal from telegraph receiver is directly connected to ECS

5.1.5 INCREASE LIMITATION (For C/R backup control and local control)

By pushing the "INCREASE LIMITATION" push button switch (alternate type) provided in the control room and local, the indicator lamp turns on and the load limit is only shifted upward by a set amount.
(Please refer to the specification of ECS (engine control system).)

6 Safety System

6.1 Manual emergency trip

6.1.1 Function of manual emergency trip

Manual emergency trip switches are provided on the following area.

① Wheel house : Illuminated push button switch
(By operating, the switch works and indicator lamp lights.
By operating again, the switch returns and indicator lamp turns off.)

② Control room : Illuminated push button switch
(By operating, the switch works and indicator lamp lights.
By operating again, the switch returns and indicator lamp turns off.)

③ Local : Illuminated push button switch
(By operating, the switch works and indicator lamp lights.
By operating again, the switch returns and indicator lamp turns off.)

With above-mentioned switch operated, the fuel is cut off to stop the engine.
At the same time, alarm of "MANUAL EMERGENCY TRIP" is given and the each cause is displayed "MANUAL TRIP" on the CDP unit.

This manual emergency trip can be operated regardless of the control position.

6.1.2 Reset of manual emergency trip

Resetting is operated according to the following procedure.

① In case of wheelhouse control :
Return the manual emergency trip switch, and put the telegraph transmitter in the Wheelhouse into stop position.
(ECS send the trip reset signal to the safety system.)

② In case of control room control :
Return the manual emergency trip switch, and put the telegraph receiver in the control room into stop position.
(ECS send the trip reset signal to the safety system.)

④ In case of local control :
Return the manual emergency trip switch, and put the maneuvering dial in the local into stop position.
(ECS send the trip reset signal to the safety system.)

6.2 Automatic emergency trip

6.2.1 Function of automatic emergency trip

The main engine is automatically trip with the fuel cut off in anyone of the following conditions.
① Over speed
② (SH-1) : Main L.O. low-low pressure
③ (SH-2A) : Hydr.oil low pressure (Non-cancelable ECS-A Trip)
④ (SH-2B) : Hydr.oil low pressure (Non-cancelable ECS-B Trip)
⑤ (SH-3A) : Hydr.oil leakage high (Cancelable ECS-A Trip)
⑥ (SH-3B) : Hydr.oil leakage high (Cancelable ECS-B Trip)

In case of over speed, emergency trip instantly operates.
In case the others, emergency trip operates after abnormal condition continued for a preset time.
If the automatic emergency trip operates, the indication of each cause will be displayed on CDP unit and the alarm of each cause is given.

This automatic emergency trip operates regardless of the control position.

6.2.2 Cancel of automatic emergency trip

In case of SH-3 A&B of abovementioned causes of automatic emergency trip, the alarm of "EMERG. TRIP PREWARNING" will be given after detecting abnormal condition and the automatic emergency trip can be cancelled by operating "EMERG. TRIP CANCEL" switch (illuminated push button switch by pushing, switch operates and indicator lamp lights. By pushing again, the switch returns and indicator lamp turns off.) which are provided in the wheelhouse, the control room and local.

If the cancelable cause occurs, the indication of "CANCEL AVAILABLE" is displayed.
The alarms of "EMERG.TRIP CANCEL" on BDP unit and control room is given.

The emergency trip cancel switch provided on wheelhouse is available during wheelhouse control condition.
It provided on the control room and local is available regardless of the control position.

Due to this canceling operation, the engine can be run again even still in abnormal condition.

The trip cancel function is effective before or after automatic emergency trip activation.

6.2.3 Individual Cancel of automatic emergency trip

The abovementioned causes SH-3 A&B can be cancelled individually by using the "INDIVIDUAL CANCEL" function.
The selected trip cause is cancelled individually by operating "cancel" switch (Once touch a push button switch, the switch is operated. Touch the button again, the switch returns) in the " TRIP INDIVIDUAL CANCEL" screen of CDP unit.
When the individual cancel switch operates, the alarm of "EMERG. TRIP CANCEL" is given and the indication of "INDIVIDUAL CANCEL" is displayed.

The "TRIP INDIVIDUAL CANCEL" switch is available regardless of the control position.

The "INDIVIDUAL CANCEL" function can not be used while the trip back up system is operating.

6.2.4 Reset of automatic emergency trip
Resetting is operated according to the following procedure.
Resetting is unable unless the abnormal condition has returned normal.

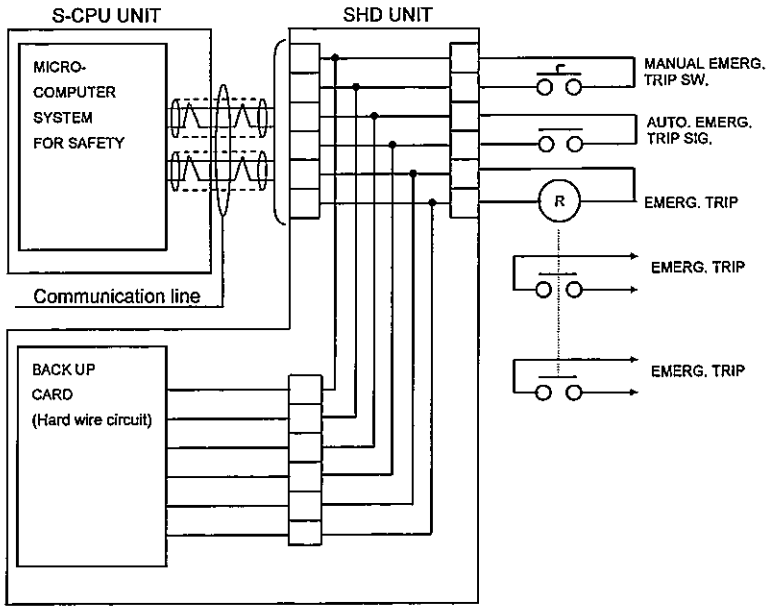
① In case of wheelhouse control :
Put the telegraph transmitter in the wheelhouse into stop position.
(ECS send the trip reset signal to the safety system.)

② In case of control room control :
Put the telegraph receiver in the control room into stop position.
(ECS send the trip reset signal to the safety system.)

③ In case of local control :
Put the maneuvering dial the local operating panel into stop position.
(ECS send the trip reset signal to the safety system.)

6.3 Back up System (Hard wire) for Safety System

When the microcomputer becomes abnormal, the Trip of engine operates by the back up function of the safety system.



6.3.1 Reset of emergency Trip

If the micro-computer has been failed and then an emergency Trip operated by the back up system, an emergency Trip can be reset by the ordinary reset procedures described on item 6.1.2 and 6.2.4.

6.4 Automatic emergency slow down

6.4.1 Function of automatic emergency slow down

In case under any of the following conditions and such abnormal condition continued for a preset time, the main engine is slowed down automatically to a preset speed (DEAD SLOW). △a

① (SL-1) : Main L.O. low pressure
② (SL-2) : Cylinder C.F.W. low pressure
③ (SL-3) : Piston C.O. high temperature
④ (SL-4) : Thrust bearing high temperature
⑤ (SL-5) : Aft stern tube bearing high temperature △a
⑥ (SL-6) : Cylinder C.F.W. high temperature
⑦ (SL-7) : Scavenging air box high temperature
⑧ (SL-8) : Cylinder outlet exhaust gas high temperature △a
⑨ (SL-9) : Cylinder outlet exhaust gas deviation high temperature △a
⑩ (SL-10) : Slow down from ECS (A)
⑪ (SL-11) : Slow down from ECS (B)
⑫ (SL-12) : Piston C.O..non flow
⑬ (SL-13) : Crankcase oil mist high density
⑭ (SL-14) : Turbocharger L.O. low pressure △a △a △b

The SL-10, 11 includes following signals.
1) ME cylinder lubricator failure
2) No exhaust valve movement (misfiring)

If the automatic emergency slow down operates, the alarm of each cause is given and the indication of each cause is displayed on the CDP unit.

Alarm of "SLOW DOWN REQUEST" is given if the above mentions occur under any of following conditions. But the main engine is not slowed down automatically.

① Main engine running under than abovementioned automatic emergency slow down speed.
② Main engine astern running
③ Slow down cancel condition
④ Local control

6.4.2 Cancel of automatic emergency slow down

In case of SL-1～SL-14 causes of automatic emergency slow down, the alarm of "EMERG. SLOW DOWN PREWARNING" will be given after detecting abnormal condition and the automatic emergency slow down can be cancelled by operating "SLOW DOWN CANCEL" switch (illuminated push button switch, by pushing, switch operates and indicator lamp lights. By pushing again, switch returns and indicator lamp turns off.) provided on the wheelhouse, the control room.

The indication of "CANCEL AVAILABLE" is displayed.
The alarms of "EMERG. SLOW DOWN CANCEL" on BDP unit and control room is given.

The emergency slow down cancel switch provided on wheelhouse is available during wheelhouse control condition.
It provided on the control room and local is available regardless of the control position.

Due to this canceling operation, the engine can be run again at equivalence with the telegraph transmitter position even still in abnormal condition.
The emergency slow down cancel function is effective by operating the slow down cancel switch before or after automatic emergency slow down activation.

6.4.3 Individual Cancel of automatic emergency slow down

The abovementioned causes SL-1～SL-14 can be cancelled individually by using the "INDIVIDUAL CANCEL" function.
The selected slow down cause is cancelled individually by operating "cancel" switch (Once touch a push button switch, the switch is operated. Touch the button again, the switch returns) in the "SLOW DOWN INDIVIDUAL CANCEL" screen of CDP unit.
When the individual cancel switch operates, the alarm of "EMERG. SLOW DOWN CANCEL" is given and the indication of "INDIVIDUAL CANCEL" is displayed.

The "SLOW DOWN INDIVIDUAL CANCEL" switch is available regardless of the control position.

6.4.4 Reset of automatic emergency slow down

Resetting is operated according to the following procedure. Resetting is unable unless the abnormal condition has returned normal.

① In case of wheel house control :
Put the telegraph transmitter in wheel house into lower than "DEAD SLOW" position.

② In case of control room control :
Put the telegraph receiver in control room into lower than "DEAD SLOW" position.

6.5 Critical speed alarm

Upon a preset time after the engine speed going between the lower limit and the upper limit of the critical speed range, the alarm of "CRITICAL SPEED" is given.

6.6 Wrong way alarm

When the ECS command towards counter direction against the direction of the telegraph transmitter under the local control, it is deemed a wrong way condition and after a preset time the alarm of "WRONG WAY" is given.

6.7 Safety system monitoring function

In each case of the following conditions, the alarm of "SAFETY SYSTEM ABNORMAL" is given and the indication of each cause is displayed on the CDP unit.

① Micro-computer CPU hard for safety system abnormal.
② Communication abnormal.
③ Revolution signal (for safety system) abnormal.
④ Manual emergency trip switch circuit disconnection.
⑤ Automatic emergency trip sensor circuit disconnection.
⑥ Automatic emergency slow down sensor circuit disconnection.
⑦ Emergency trip reset signal circuit disconnection. (EICU-A)
⑧ Emergency trip reset signal circuit disconnection. (EICU-B)

The "Major Failure" or the "Minor Failure" is displayed on the BDP & CDP unit by the kind of abnormal cause.

When the abnormal cause is backed up by SUB SYSTEM or the sensor & switch circuit disconnection, "MINOR FAILURE" is displayed.

When both MAIN and SUB SYSTEM are abnormal condition, "MAJOR FAILURE" is displayed.

- The cause of "Minor Failure"
  ① Either Main or Sub Communication abnormal.
  ② Either Main or Sub Revolution signal (for safety) abnormal.
  ③ Manual emergency trip switch circuit disconnection.
  ④ Automatic emergency trip sensor circuit disconnection.
  ⑤ Automatic emergency slow down sensor circuit disconnection.
  ⑥ Emergency trip reset signal circuit disconnection. (EICU-A)
  ⑦ Emergency trip reset signal circuit disconnection. (EICU-B)

- The cause of "Major Failure"
  ① Micro-computer CPU hard for safety system abnormal.
  ② Both Main and Sub Communication abnormal.
  ③ Both Main and Sub Revolution signal (for safety) abnormal.

6.8 Wheelhouse alarm repose

In case of the wheelhouse sub telegraph "F/E" is ordered, the wheelhouse alarm is reposed. Except TELEGRAPH SOURCE FAIL.alarm.

6.9 Engine speed test for safety

Engine speed test function is provided on the CDP unit.
And simulation test engine revolution on the safety system is able to apply.

Note : It does not become the engine speed test condition during the main engine is running.

7 Source failure

7.1 Electric source failure

Abnormal	Manual emerg. Trip	Auto. emerg. Trip	Auto. emerg. slow down	Remarks
Main source failure (AC SOURCE)	O	O	O	Changing to emerg. source and normal operation continue
Emergency source failure (DC24V)	O	O	O	No influence
Main and emergency source failure	×	×	×	Maintain the existing state of things

O : Available operation
× : Not available operation

7.2 Pneumatic source failure

Abnormal	Manual emergency Trip	Auto. emerg. Trip	Auto. emerg. slow down	Remarks
Air failure	O	O	O	Maintain the existing state of things

O : Available operation
× : Not available operation

8 Telegraph

8.1 Main telegraph

8.1.1 Fitting

The equipments of main telegraph are provided on the following area.

① Wheelhouse :
Illuminated lever type transmitter (with buzzer),

② Ceiling :
LED type repeater (Two face)

③ Control room :
Illuminated lever type receiver (with buzzer),

④ Local :
Push button type receiver, Gong

8.1.2 Division

Ahead side ····· DEAD SLOW, SLOW, HALF, FULL, NAV.FULL
Astern side ····· DEAD SLOW, SLOW, HALF, FULL, E.FULL
And ····· STOP

8.1.3 Function (Refer to operation pattern)

① In case of control room or local control, when the transmitter is operated, the ordered division flickers and the buzzer and gong sound.
Next, by replying with the receiver, the ordered division turns continuous lighting and the buzzer and gong stop sounding.

② In case of wheelhouse control, the buzzer and gong sound for 2 seconds at the new order and ordered division lights continuously.
Control room or local control is not necessary to reply.

Operation pattern of main telegraph at wheelhouse control

	W/H TRANSMITTER	C/R RECEIVER	LOCAL RECEIVER	SOUND
	SLOW / D·SLOW / STOP	SLOW / D·SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	
W/H ORDER	SLOW / ◎ D·SLOW / STOP	SLOW / ◎ D·SLOW / STOP	ST; ◎ AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	*≪
	SLOW / D·SLOW / STOP	SLOW / D·SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	

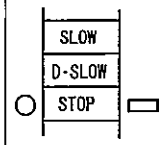
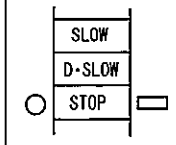
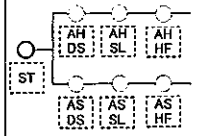
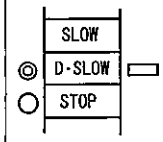
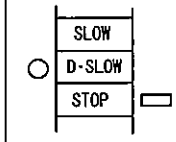
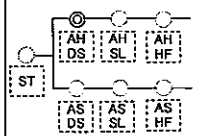
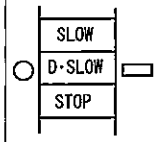
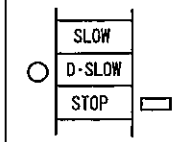
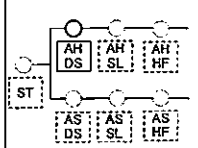
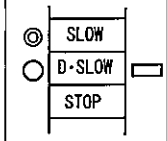
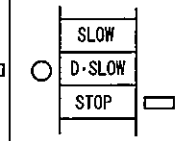
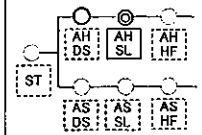
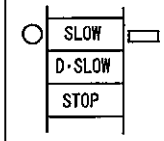
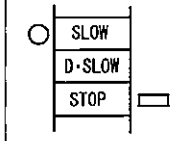
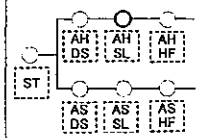
○ : LAMP CONTINUOUS LIGHTING
◎ : LAMP FLICKERING FOR 2 SECONDS
≪ : AUDIBLE EQUIPMENT SOUNDING
*≪ : AUDIBLE EQUIPMENT FOR 2 SECONDS
▭ : TELEGRAPH LEVER POSITION
ST : LOCAL TELEGRAPH RECEIVER SWITCH NOT OPERATION

Operation pattern of main telegraph at control room control

	W/H TRANSMITTER	C/R RECEIVER	LOCAL RECEIVER	SOUND
ANSWER CONDITION	SLOW / D·SLOW / STOP	SLOW / D·SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	
W/H ORDER	SLOW / ◎ D. SLOW / STOP	SLOW / ◎ D. SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	≪
C/R ANSWER	SLOW / D. SLOW / STOP	SLOW / D. SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	
C/R ORDER	◎ SLOW / D. SLOW / STOP	◎ SLOW / D. SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	≪
W/H ANSWER	SLOW / D. SLOW / STOP	SLOW / D. SLOW / STOP	ST; AH DS, AH SL, AH HF; AS DS, AS SL, AS HF	

○ : LAMP CONTINUOUS LIGHTING
◎ : LAMP FLICKERING
≪ : AUDIBLE EQUIPMENT SOUNDING
*≪ : AUDIBLE EQUIPMENT FOR 2 SECONDS
▭ : TELEGRAPH LEVER POSITION
ST : LOCAL TELEGRAPH RECEIVER SWITCH NOT OPERATION

Operation pattern of main telegraph at local control

	W/H TRANSMITTER	C/R RECEIVER	LOCAL RECEIVER	SOUND
ANSWER CONDITION				
W/H ORDER				≪
LOCAL ANSWER				
LOCAL ORDER				≪
W/H ANSWER				

SLOW / D-SLOW / STOP

AH DS / AH SL / AH HF

AS DS / AS SL / AS HF

ST

○ : LAMP CONTINUOUS LIGHTING
◎ : LAMP FLICKERING
≪ : AUDIBLE EQUIPMENT SOUNDING
*≪ : AUDIBLE EQUIPMENT FOR 2 SECONDS
▭ : TELEGRAPH LEVER POSITION
ST : LOCAL TELEGRAPH RECEIVER SWITCH OPERATION

8.2 Sub telegraph (Sub telegraph system is equipped in the telegraph system)

8.2.1 Fitting

The equipment of sub telegraph are provided on the following area.

① Wheelhouse :
Light and push button type transmitter
(Installed in telegraph transmitter)

② Control room :
Light and push button type receiver
(Installed in telegraph receiver)
Push button switch for sound stop
(Installed in telegraph receiver)

③ Local :
LED and push button type receiver
(Installed in telegraph receiver)
Push button switch for sound stop
(Installed in telegraph receiver)

The buzzer and gong for main telegraph are common used.

8.2.2 Division

Finished with Engine: (F/E)
Stand by : (S/B)
Run up : (R/U)

8.2.3 Function (Refer to operation pattern)

By pushing the push button switch of sub telegraph on transmitter in the wheelhouse, the LED that is ordered division flickers, and the buzzer and gong sound.
Under this condition, by pushing the push button switch on receiver that is ordered division, the LED turns continuous lighting, and the buzzer and gong stop sounding.

In case of S/B or F/E order , by pushing the sound stop push button switch before replying, the buzzer and gong stop sounding but the LED keeps flickering.
Under this condition, by pushing the push button switch of receiver that is ordered division, the LED turns continuous lighting, and the buzzer and gong sound for 2 seconds.

In case of R/U order, by pushing the push button switch of sub telegraph on telegraph transmitter in the wheelhouse, the indicator of R/U flickers and the buzzer and gong sound.
Under this condition, by pushing the R/U push button switch of receiver, the indicator turns continuous lighting and the buzzer and gong sound for 2 seconds

Operation pattern of sub telegraph

W/H or C/R(LOCAL) ORDER			W/H or C/R(LOCAL) REPLY			C/R (LOCAL) SOUND STOP	W/H INDI. LED			C/R(LOCAL) INDI. LED			SOUND	REMARKS
F/E	S/B	R/U	F/E	S/B	R/U		F/E	S/B	R/U	F/E	S/B	R/U		
							○			○				←
	□							◎			◎		≪	
						□		◎			◎			
				□				○			○		*≪	
		□							◎			◎	≪	
					□				○			○		
	□							◎			◎		≪	
				□				○			○			
□							◎			◎			≪	
						□	◎			◎				
			□				○			○			*≪	←

Symbol

○	:	LAMP CONTINUOUS LIGHTING
◎	:	LAMP FLICKERING
□	:	PUSH BUTTON SWITCH OPERATION
≪	:	AUDIBLE EQUIPMENT SOUNDING
*≪	:	AUDIBLE EQUIPMENT FOR 2 SECONDS

8.1 ME STOP – RUN function

・ME STOP

By pushing the push button switch of "ME STOP" in control room, the signal of "FWE REQUEST" is sent from RCS to ECS.
When the ECS receives the above signal, the auxiliary blowers as well as the hydraulic power supply are stopped automatically.
(Please refer to the specification of ECS (engine control system))
Additionally, engine start has to be blocked manually/mechanically, i.e. the following preparation is carried out manually. (The following signals are supplied from ECS)

・Engine blocked condition

① Main start valve blocked
② Starting air distribution system blocked.
③ Control air vented.

The "ME STOP" lamp keeps blinking until the above conditions are satisfied, when the above conditions are satisfied, it turns to light continuously.

・ME RUN

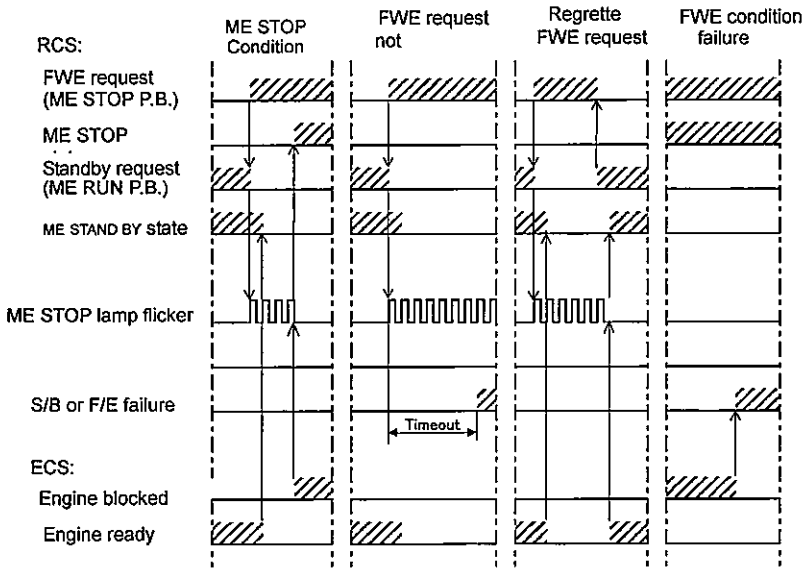
By pushing the push button switch of "ME RUN" in control room, the signal of "STANDBY REQUEST" is sent from RCS to ECS.
When the ECS receives the above signal, the ECS will automatically start the hydraulic power supply and see to that the auxiliary blowers are operational.
(Please refer to the specification of ECS (engine control system))
Additionally, the engine is manually brought into the "ENGINE READY" condition.
The "ME RUN" lamp keeps blinking until the following conditions are satisfied, when the following conditions are satisfied, it turns to light continuously. (The following signals are supplied from ECS)

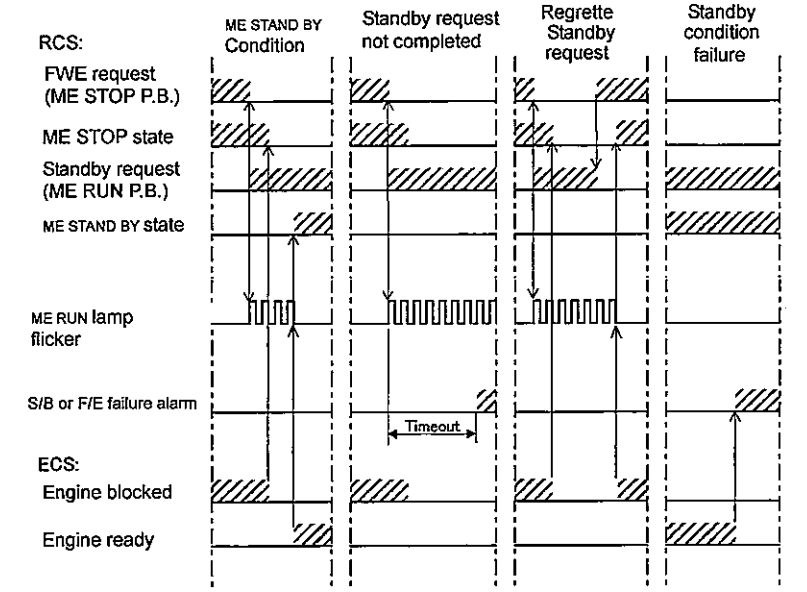
・Engine ready condition

① Main start valve in service position
② Starting air distribution system in service position.
③ Turning gear disengaged
④ Control air pressure OK
⑤ Hydraulic supply system OK
⑥ Auxiliary blowers operational
⑦ ECS OK

The operation pattern is described to next page.

・Function





8.2 Telegraph logger

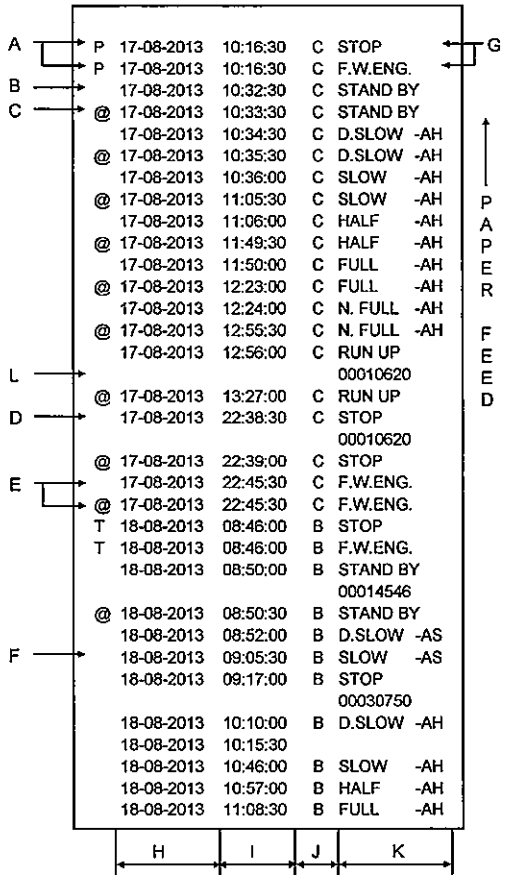
The telegraph logger is provided on the wheelhouse stand.
The telegraph logger is to monitor positions of the transmitter and receiver of main telegraph and sub telegraph constantly.

If any variation occurs on the position of main telegraph transmitter, the new position where the transmitter placed is printed together with control position and the time.
Then upon detecting coincidence signal of both position of receiver and transmitter, the position where the receiver placed is printed together with control position and the time.
While the control position is on the wheelhouse, print in response cannot be performed even if both position of the transmitter and receiver coincide.

Push button switches provided front panel of the telegraph logger can carry out setting of the time.

Furthermore, this setting is not necessary again after it was carried out once.

Print out format of telegraph logger (a)



PAPER FEED

SUB TELEGRAPH	PRINT
1. FINISHED WITH ENG.	F.W.ENG.
2. STAND BY	STAND BY
3. RUN UP	RUN UP

MAIN TELEGRAPH	PRINT
1. AHEAD NAV. FULL	N. FULL-AH
2. AHEAD FULL	FULL -AH
3. AHEAD HALF	HALF -AH
4. AHEAD SLOW	SLOW -AH
5. AHEAD DEAD SLOW	D.SLOW-AH
6. STOP	STOP
7. ASTERN DEAD SLOW	D.SLOW-AS
8. ASTERN SLOW	SLOW -AS
9. ASTERN HALF	HALF -AS
10. ASTERN FULL	FULL -AS
11. EMEGENCY FULL	EMERG. FULL

CONTROL POSITION	PRINT
1. WHEELHOUSE	B
2. CONTROL ROOM	C
3. LOCAL	E

A : IN CASE OF POWER SUPPLIED
B : ORDER (PAINTING COLOR : BLACK)
C : ANSWER (PAINTING COLOR : BLACK)
D : ANSWER MARK
E : TEST PRINT MARK
F : TIME PRINT
G : POWER SUPPLIED MARK
H : DAY
I : TIME
J : CONTROL POSITION
K : TELEGRAPH POSITION
L : TOTAL REVOLUTION