INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE LCB II CURRENT DIFFERENTIAL LINE PROTECTION RELAY SYSTEM & TYPE LCB II RELAY MODULES

TABLE OF CONTENTS

ADDENDUM TO I.L.40-217 AND I.L.40-218

This addendum contains information updates regarding two new modules which have been incorporated into the LCBII system. The addendum applies to all LCBII systems shipped after January 1, 1987.

New modules are:

1) IFDT module which replaces IFT module.
   (NOTE: LCBII relays with IFDT module can only communicate with LCB systems with IFDT modules).
2) IFO 1300 NM module for optical systems.

Due to the replacement of the IFT by the IFDT module, the "Loss of Channel" and "Return to Normal" block timers on the RELAY module were changed from 22 msec to 45 msec. This change insures proper coordination for removing the erroneous demodulated remote quantity VR from the comparison circuits before inserting overcurrent trip. This modification will be incorporated in all LCBII relays shipped after January 1.

EFFECTIVE AUGUST 1987

CHANGES TO I.L.40-217

OPERATION SECTION; FUNCTIONAL OPERATION, pg 9, para. 5

Channel trouble output (EN) connected to RELAY module will activate an abnormal channel timer of 45 msec. The LCB can still be used as an overcurrent function after 45 msec instead of 22 msec.

LCBII ACCEPTANCE TEST PROCEDURE; Section XI, pg 26 (D4) and pg 27 (F4)

Removing the input signal to the receiver should cause terminal 2 of the AXLM module to rise to +15 Vdc for 45 msec (instead of 20 msec) then return to 0 volts for approximately 105 msec (instead of 130 msec.) before returning to +15 Vdc.

TYPE LCBII RELAY WITH DUAL TONE INTERFACE (IFDT)

This information relates specifically to the replacement of Tone Interface Module (IFT) style 1603C80G01 with Dual Tone Interface module (IFDT) style 1606C93G01. The IFDT module provides additional security for audio tone links subject to frequency translation occurrences.

INTRODUCTION:

The IFDT module is an enhancement to the IFT module and provides high speed detection of frequency translation occurrences. A pilot tone has been incorporated into the design of this "IFDT" tone module. The monitoring of this pilot tone in addition to the present carrier monitoring adds another level of relay system security without decreasing dependability.

The carrier monitoring features include high level signal detection, low level signal detection, high speed SNR detection and fast responding frequency detection. All of this takes place within the modulated carrier signal detection range of 1.0 to 2.5 KHz. This window of 1.5 KHz allows for proper carrier recognition. The new additional feature of pilot tone detection complements the carrier signal monitoring. The pilot tone signal is established outside the modulated carrier range yet the carrier and pilot signal are transmitted together allowing channel disturbances affecting the carrier to equally affect the pilot. These disturbances in pilot are separately monitored for level detection, frequency deviation and excessive noise, all within a window of only 40 Hz.

The addition of this second level of monitoring requires that LCB relays with the IFDT module communicate only with other terminals containing IFDT tone modules.

OPERATION SECTION; SYSTEM OPERATION, pg. 6, para. 1

Block diagrams figs. 4 and 5, audio-tones, 2 and 3-terminal lines are superseded by drawings 2398F07 and 2398F08 which show the new audio tone interface block diagrams.

OPERATION; FUNCTIONAL OPERATION, pg. 8, para. 4 thru pg. 9, para. 2

The LCB Block Diagram drawings show the audio tone interface module, IFDT (see left handside). This module may be divided into three basic functional elements consisting of carrier receiver, channel monitoring, including receiver for pilot frequency, and transmitter.

Terminals 9 and 7 are the inputs to the IFDT receiver. The incoming signals go through an isolation transformer, then through a common-mode noise-rejection circuit to a scaling circuit. Depending on the received composite signal level, this circuit may be set by a link to act as either an amplifier or attenuator. The carrier signal is then adjusted to the nominal AGC level using a control accessible at the front panel of the module (RX ADJ). At the output of the scaling circuit, the signal is sent to both the carrier receiver circuit and to the frequency detector circuit. Continuing with the carrier receiver path the pilot signal is first removed using a notch filter, followed by a band-pass filter which eliminates noise and spurious signals outside the desired 1 to 2.5 KHz modulated carrier range. The automatic gain control (AGC) unit maintains a nearly constant magnitude signal going to the demodulator.

The AGC control voltage is used for High and Low signal level monitoring as well as the reference for signal-to-noise (SNR) monitoring.

In the high/low limit monitoring circuit, the AGC control voltage is compared with predetermined levels. The differential comparison function of the relay is permitted to perform only when the incoming carrier is within these set limits ($\pm$ 10dB).

In the SNR monitoring circuit, the carrier signal output from the AGC circuit is conditioned by a band-reject circuit (carrier removal), and only the noise voltage will remain at the output of this circuit. An absolute-value circuit is used to further process the noise into a dc quantity which in turn is to be compared with a voltage derived from the AGC control voltage for the desired SNR level. If the noise voltage equals or exceeds the set level, a block signal will occur. The use of the AGC control voltage for the SNR level setting permits the SNR monitoring to be a truly relative function not tied to any specific input signal or noise level. The noise voltage obtained in this circuit is used yet for another purpose.

In the relay design, as described earlier, the remote and the local current quantities are evaluated by circuits which perform the vector comparison and magnitude comparison. The outputs of the two comparisons are then combined to determine a trip. If the recovered remote current contains noise due to a noisy channel, it is desirable that this noise can be recognized and eliminated. The very nature of the comparison technique and the characteristics of random noise have already provided some inherent noise rejection. However, additional noise rejection is achieved by relating the noise voltage (VN) to the trip reference. This feature provides an adaptive desensitized trip maintaining the comparison accuracy in the presence of channel noise.

The frequency detector circuitry monitors a pilot frequency that is received with the carrier signal. The signal from receiver scaling circuit goes through a band-pass filter that eliminates noise and spurious signals outside the desired 2700 to 2850 Hertz pilot range including the unmodulated carrier signal. The limiter converts the analog signal to a digital signal and provides on board indication if pilot level falls below the setting of 2762 Hertz level detector. The frequency discriminator and detector circuitry performs a comparison of the received pilot frequency to a reference frequency and provides an output if within predetermined frequency limits.

The high/low carrier frequency detector is a fast responding detection circuit which directly senses the carrier signal and provides an output if the signal is outside of its range for more than one cycle.

The output of SNR circuitry is "OR"-ed with output of pilot Frequency detector circuitry producing a SNR indication if abnormal noise or frequency conditions occur. The "OR"-ed signal is then stretched to provide an additional 100 msec delay before returning to normal. The output of the Lo and Hi level detectors are "OR-ED", with output and separate Hi/Lo indication occurring when received signal exceeds +/-10dB from normal received carrier signal. This "OR"-ed output is stretched with an additional 600 msec delay before returning to normal. The output of carrier frequency detector and outputs of respective SNR and Hi/Lo level conditioning timers are "OR"-ed together to provide a "high" on EN or "low" on CA only when abnormal conditions are present. The two separate conditioning timers provide the appropriate time delays for system restoration.

The transmitter combines the carrier signal with a crystal generated pilot signal to obtain a composite. The transmitter-level control is a combination unit which is used to adjust the transmitter output to the level required by the tone channel used with the relay system. The signal conditioning circuit converts the incoming square waves to a composite sine wave, and the protection and isolation unit provides a safe and matched connection to the channel.

LCBII CHARACTERISTICS; pg. 12, Number 4

In addition to the 1700 hertz, unmodulated carrier frequency, a fixed, 2762 hertz, pilot frequency will be present.

LCBII ACCEPTANCE TEST PROCEDURE; Section VI, pg. 23, Section A1

When moving "XdB" link to verify table, an AC True rms voltmeter must be used. Upon setting output level for 775 mV (0dBm, 600 ohm) at "XMTR OUT", the Pilot to Carrier separation can be verified. Remove "RFO" link, measure and record level at 2762 Hz. Replace "RFO" link and remove "PF1" link, measure and record level at 1700 Hz. The difference in levels recorded should be 6dB (+/- .75dB).

ACCEPTANCE TEST PROCEDURE; Section VI
Receiver Sensitivity, pg. 24 Number 3.

Noise evaluation test (IFDT) only.

(a) Connect an oscillator set at 1000 Hz or noise generator (continuous noise) through a 600 ohm attenuator to printed circuit board (PCB) terminals 9 and 7.

(b) With the oscillator turned off, but attenuator connected to terminals 9 and 7 and at least 10 dB attenuation, measure and record the signal at "AGC IN" and "RX IN" with the normal received tone signal (measured in dB).

(c) Increase amplitude of oscillator until the "SNR" indicator just begins to operate, terminal 25 should drop from +15 to 0 volts dc.

(d) Disconnect the incoming transmitted signal from receiver input by removing the "XdB" link on corresponding IFDT module. The measured signal at "AGC IN" should be 17dB (±2 dB) less than the signal measured in step b.

(e) Replace "XdB" link to +15dB position and remove "PF1" link on same module. Set oscillator for 2762 hertz and adjust level to obtain the same voltage at "RX IN" as recorded in step b above.

(f) Gradually increase frequency, not level, of oscillator until "SNR" indicator just turns "ON", voltage on terminal 25 should be +15 Vdc and voltage on terminal 29 should be 0 Vdc. Frequency of oscillator should be 2777 to 2787 Hertz.

(g) Gradually decrease frequency, not level, of oscillator below 2762 hertz until "SNR" indicator again just turns "ON". Voltage on terminal 25 should be +15 Vdc and voltage on terminal 29 should be 0 Vdc. Frequency of oscillator should be 2747 to 2737 Hertz.

(h) Remove oscillator from terminals 9 and 7. On board indicator should be on. Replace "PF1" link on IFDT module. On board indicator should be off.

LCBII CALIBRATION PROCEDURES; Section IV, pg. 32

A. "Hi" Level Adjustment (IFDT)

With the channel receiving a signal either from the remote terminal or back to back, adjust the signal at "AGC IN" to 0.436 Vrms with "RX ADJ". At this level (+10 dB from normal) adjust potentiometer P5 so that the "Hi" level indicator just lights. This adjustment has been factory set and should not be adjusted unless absolutely necessary.

B. 1700 Hz Trap Adjustment (IFDT)

Remove IFDT module terminals 9 and 7 from channel and connect oscillator through 600 ohm attenuator. Monitor TP12 using a AC true rms voltmeter. Sweep the frequency from 1500 Hz to 1900 Hz and adjust P4 until the peak between 1500 and 1700 Hz is equal to to the peak between 1700 and 1900 Hz. This adjustment was factory set using a spectrum analyzer. P4 should not be adjusted unless absolutely necessary.

C. 2762 Hz Trap Adjustment (IFDT)

With the channel receiving an unmodulated signal, remove "RFO" link from transmitting IFDT module and adjust potentiometer P3 for minimum dc voltage at TP4. This adjustment has been factory set and should not be adjusted unless absolutely necessary.

LCBII CATALOG NUMBER; pg. 43

IFDT Module style is 1606C93G01.

GLOSSARY OF TERMS; INTERNAL SIGNALS, pg. 46

NT1, NT2 replaced by +5V output signal.
HA1, HA2 replaced by FA1, FA2 (Carrier Frequency Alarm).

TYPE LCBII RELAY WITH 1300 NM OPTICAL INTERFACE AND SMA CONNECTORS

This information relates specifically to the LCBII relay for use with a 1300 nm wavelength LED, PIN photodiode, and SMA connectors. The optical fiber employed for this may be multimode 50/125 (or greater) graded-index dual-window fiber, or single mode 9/125 fiber. The fiber-optic cable terminates to the LCB with an SMA connector.

APPLICATION; CHANNEL CONSIDERATIONS SECTION; FIBER OPTIC, PG. 5, PARA. 2

The LCB is also available for operation at a wavelength of 1300 nm, where fiber attenuation is generally lower, with either graded-index dual-window 50/125 fiber or with single mode 9/125 fiber.

The light power level encountered when the 1300 nm LED is coupled into a 50 micrometer graded-index dual-window fiber is -25 dBm, and that for a 9 micrometer single mode fiber is -40 dBm. The loss is basically due to the diameter difference between the LED spot and the fiber core. The larger the fiber used, the lower the coupling loss will be.

At 1300 nm, the maximum allowable channel attenuation for the 50/125 graded-index dual-window fiber is 30 dB. For single mode 9/125 fiber, the maximum allowable channel attenuation is 15 dB. These attenuation levels are based on the LED light source and PIN detector selected, and consist of losses in the fiber-optic cable itself, splice losses, and connector losses. (The LCB coupling losses have already been accounted for.) The stated channel attenuation limits allow for a 3 dB system degradation and a minimum of a 20 dB signal-to-noise ratio at the receiver.

As an example of a loss calculation for a 9/125 fiber:

Assume the average loss of the fiber used to be 0.5 dB/km at 1300 nm, and the optical channel length 20 km, with 6 fusion-type splices (0.5 dB/splice) and 2 connectors (1 dB/connector).

Channel loss = (20 Km) (0.5 dB/Km) +
6 splices (0.5 dB/splice) +
2 connectors (1 dB/connector) * = 15 dB

* These are connectors other than the LCB terminal connectors.

The example described represents the maximum channel loss for this system. If the cable had been 50/125 dual-window, with a typical loss of 2 dB/Km (at 1300 nm), having the same number of splices and connectors, the maximum repeaterless channel length would have been only 12.5 Km. However, if a larger core multimode graded-index fiber is used, (with 2 dB/Km) this distance would be greater, since more power can be coupled to the fiber as mentioned earlier.

LCBII CHARACTERISTICS SECTION, pg. 14

15. Fiber-Optic Cable Interface (1300 nm, single mode or Multimode)

    Frequency response: 1.0-2.5 kHz

    Minimum optical power input to maintain 20 dB SNR is 1.6 nanowatts.

    Low signal level setting - 1.6 nanowatts.

    Optical channel capability is 15 dB when using a 9 micrometer core fiber cable, at 1300 nm.

    Optical channel capability is 30 dB when using a 50 micrometer core dual-window fiber cable, at 1300 nm.

    Optical power output - 0.5 milliwatt.

RECOMMENDED TEST EQUIPMENT, pg. 21

11. Optical cable with SMA connectors for connecting the relay back-to-back, or measuring levels.

    10 meter length 50/125 fiber, Westinghouse Style 1604C71G04.
    10 meter length 9/125 fiber, Westinghouse Style 1604C71G08.

LCBII ACCEPTANCE TEST PROCEDURE; SECTION VI, CHANNEL INTERFACE (IFO MODULE(S)), pg. 23 thru pg. 24

A. Transmitter Output

NOTE: A short alignment sleeve should be used on the SMA-terminated fiber optic cable when interfacing to the LED (transmitter).

(2.) Optical Interface Module(s) IFO-1 and IFO-2 (when used)

There is no transmitter adjustment. The LED light output power level, from a 50/125 graded-index dual-window multimode fiber should be -25 dBm or greater, and that for 9/125 single-mode fiber should be -40 dBm or greater. The light level can be optimized by loosening the connector sleeve, rotating it to find the peak output, and tightening it once again. Essentially, this aligns the optical fiber with the LED spot.

B. Receiver Sensitivity

(2.) Optical Interface Module(s) IFO-1 and IFO-2 (when used)

Paragraph (2) if for 850 nm wavelength.

For 1300 nm and 50/125 graded-index dual window fiber: If an (1300 nm) optical attenuator is available and connected between transmitter output and receiver input, vary attenuator until "LO" indicator lights. This attenuation should be 30 dB or greater, including optical attenuator insertion loss. AGC should read -6 Vdc (± 0.5 Vdc) when the light turns on. For 1300 nm and 9/125 Single mode fiber: The attenuation should be 15 dB or greater, including optical attenuator insertion loss. AGC should read -6 Vdc (± 0.5 Vdc) when the light turns on.

If an optical attenuator is not available, then simply disconnect the optical cable between transmitter and receiver, and observe "LO" indicator light.

FIELD SETUP AND VERIFICATION PROCEDURE; SECTION I, COMMUNICATION CHANNEL ADJUSTMENT; pg. 34

A. Transmitter

1. Optical Channel

NOTE: A short alignment sleeve should be used on the SMA-terminated fiber optic cable when interfacing to the LED (transmitter).

a. Channel 1 (IFO-1) - No adjustment is required. However, the transmitter (LED) light output can be optimized by loosening the connector sleeve, rotating it to find the peak output, and tightening it once again. Essentially, this aligns the optical fiber with the LED spot. The light output power level should be as follows:

1) 9/125 single mode fiber ---- -40 dBm or greater.

2) 50/125 graded-index, dual-window fiber ---- -25 dBm or greater.

b. Channel 2 (IFO-2) - 3 terminal lines. Follow the same procedure as above.

B. Receiver

(NOTE: Transmitters must be adjusted first).

1. Optical Channel

a. Channel 1 (IFO-1) - same as in I.L.40-217, except for the "LO" indicator NOTE stated, which refers to 850 nm. For 1300 nm, the following applies:

1. 9/125 single mode fiber -----

"LO" indication should occur with 15 dB, or more, of attenuation between transmitter and receiver.

2. 50/125 graded-index, dual-window fiber -----

"LO" indication should occur with 30 dB, or more, of attenuation between transmitter and receiver.

b. Channel 2 (IFO-2) - 3 terminal lines - same as above.

LCBII CATALOG NUMBER; pg. 43 thru pg. 44

Position 7

Code B: Fiber Optic, 1300 nm, multimode or single mode fiber, SMA connector.

Fiber Optic Channel-2 Terminal

IFO-1 Module - (POS F)

Style 1605C05G03 - Fiber Optic, 1300 nm, single mode or multimode fiber, SMA connector.

pg. 44, Fiber-Optic connector cable: (additional style)

Style 1604C71G08, 10 meter long, 9/125 micrometer single mode fiber-optic cable with SMA connectors on each end.

CHANGES TO I.L.40-218

MODULE APPLICATION/DESCRIPTION SECTION; IFDT, pg. 2, para. 3

In the receive portion, input level sensitivity is adjustable and stabilized with an AGC circuit. Detection circuits are employed for high and low level, excessive noise to signal levels, frequency translation, and missing cycle periods.

IFDT Module - Style 1606C93G01

Internal Schematic:	1353D79
Component Location:	1496B32
Chassis Location:	POS. F (Channel 1) POS. E (Channel 2)

IFO Module - Style 1605C05G03 (1300 NM/SMA option)

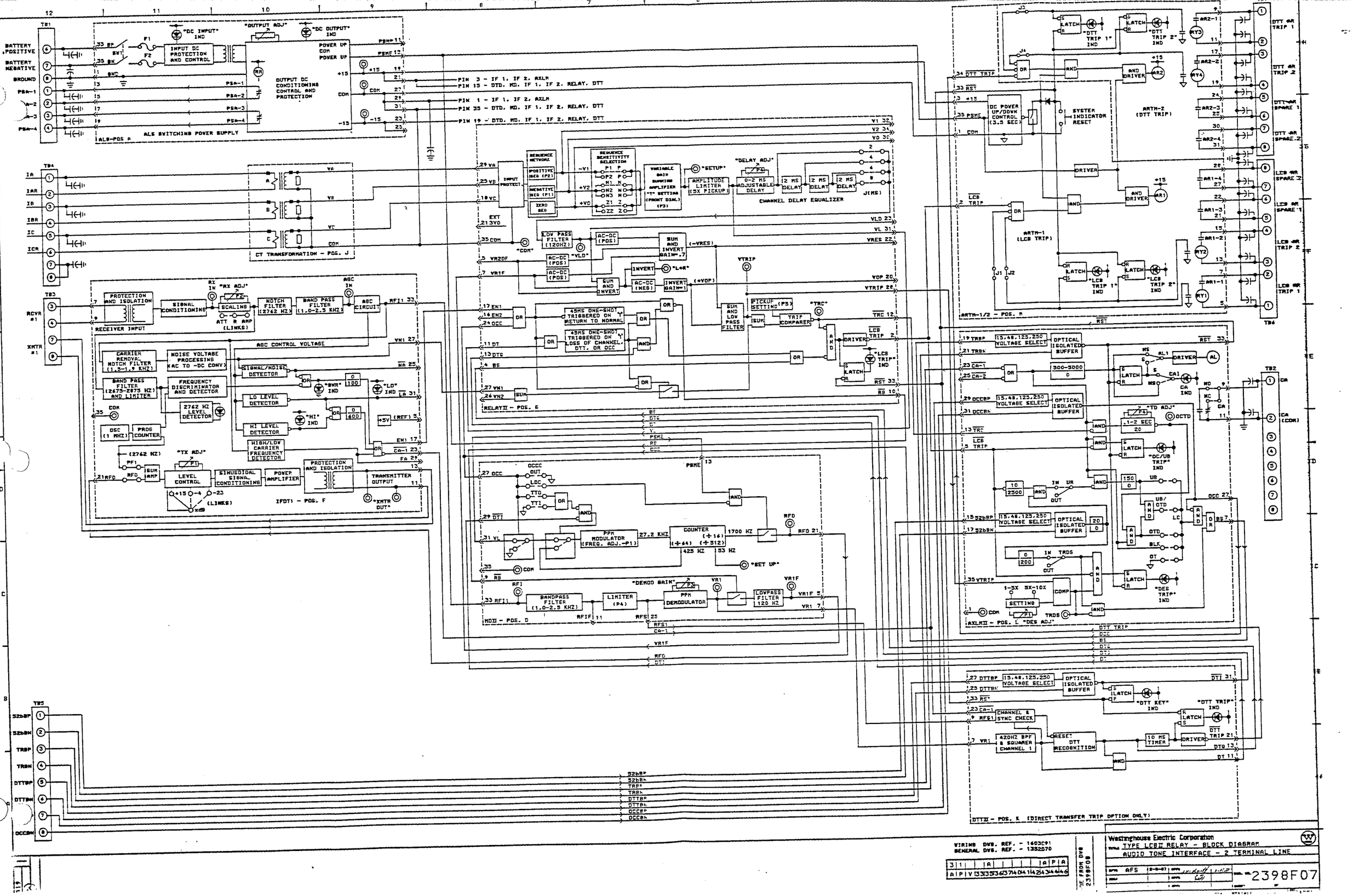
Internal Schematic:	1352D88
Component Location:	1494B65
Chassis Location:	POS. F (Channel 1) POS. E (Channel 2)

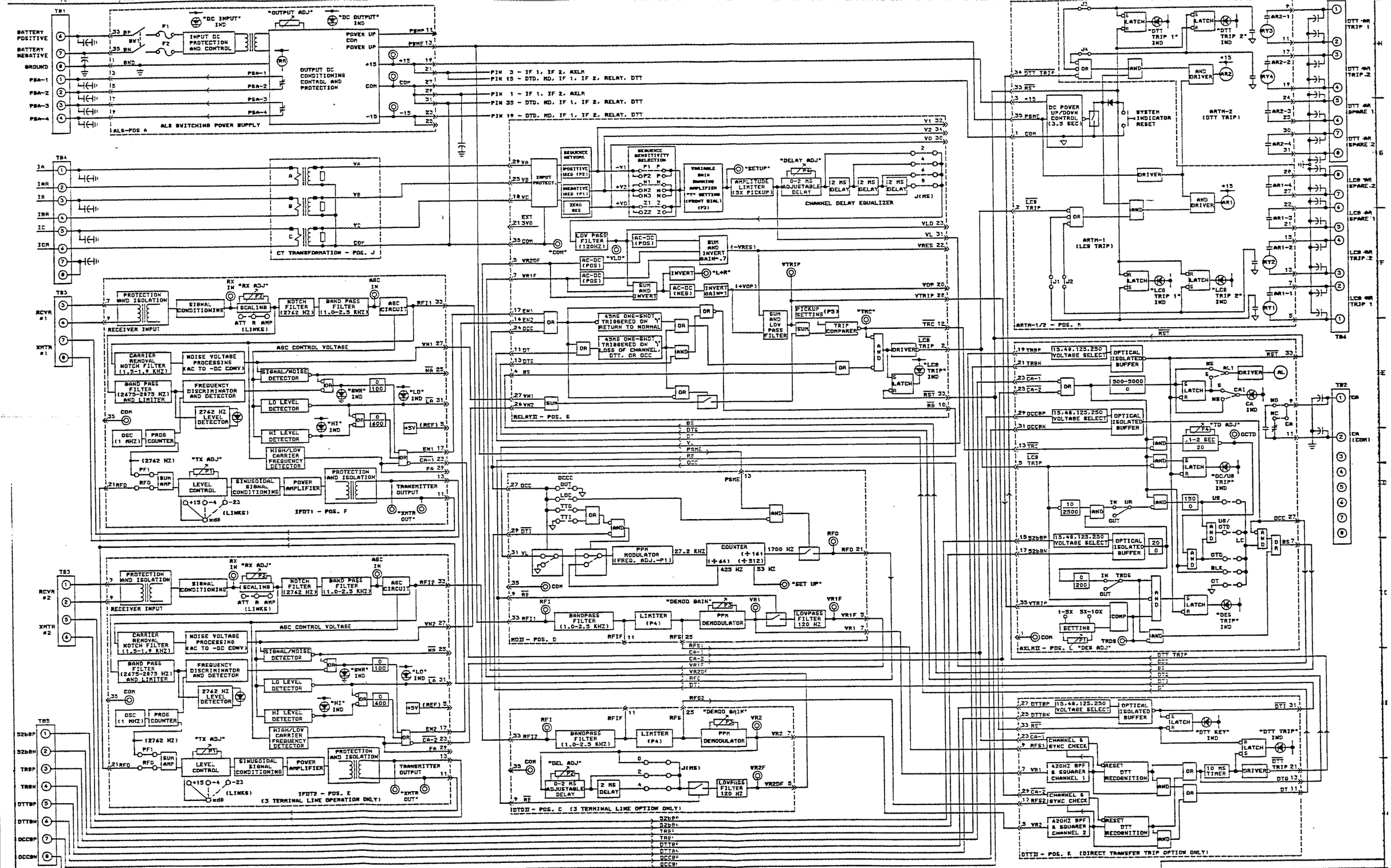
RELAY Module - Style 1603C78G01

Internal Schematic:	1351D97
Component Location:	1493B69
Chassis Location:	POS. G

ATTACHMENTS:

1.	LCBII Block Diagram - Audio Tone - 2 Terminal Lines	2398F07
2.	LCBII Block Diagram - Audio Tone - 3 Terminal Lines	2398F08
3.	LCBII Block Diagram - Fiber Optic - 2 Terminal Lines	2381F99
4.	LCBII Block Diagram - Fiber Optic - 3 Terminal Lines	2382F01
5.	LCBII System Schematic - Audio Tone - 2 Terminal Lines	2398F09
6.	LCBII System Schematic - Audio Tone - 3 Terminal Lines	2398F10
7.	LCBII System Schematic - Fiber Optic - 2 Terminal Lines	2383F23
8.	LCBII System Schematic - Fiber Optic - 3 Terminal Lines	2383F24
9.	IFDT Internal Schematic	1353D79
10.	IFO Internal Schematic	1352D88
11.	RELAY Internal Schematic	1351D97
12.	IFDT Component Location	1496B32
13.	IFO Component Location	1494B65


ALS SWITCHING POWER SUPPLY
CT TRANSFORMATION - POS. J
RECEIVER INPUT
IFDT1 - POS. F
RELAY II - POS. E
MDII - POS. D
CHANNEL DELAY EQUALIZER
ARTM-1/2 - POS. M
ARTM-1 (LCB TRIP)
ARTM-2 (DTT TRIP)
AXLM II - POS. L "DES ADJ"
DTT II - POS. K (DIRECT TRANSFER TRIP OPTION ONLY)
Westinghouse Electric Corporation
TYPE LCB II RELAY - BLOCK DIAGRAM
AUDIO TONE INTERFACE - 2 TERMINAL LINE
2398F07



Westinghouse Electric Corporation

TYPE LCB'II' RELAY - BLOCK DIAGRAM

AUDIO TONE INTERFACE - 3 TERMINAL LINE

2398F08

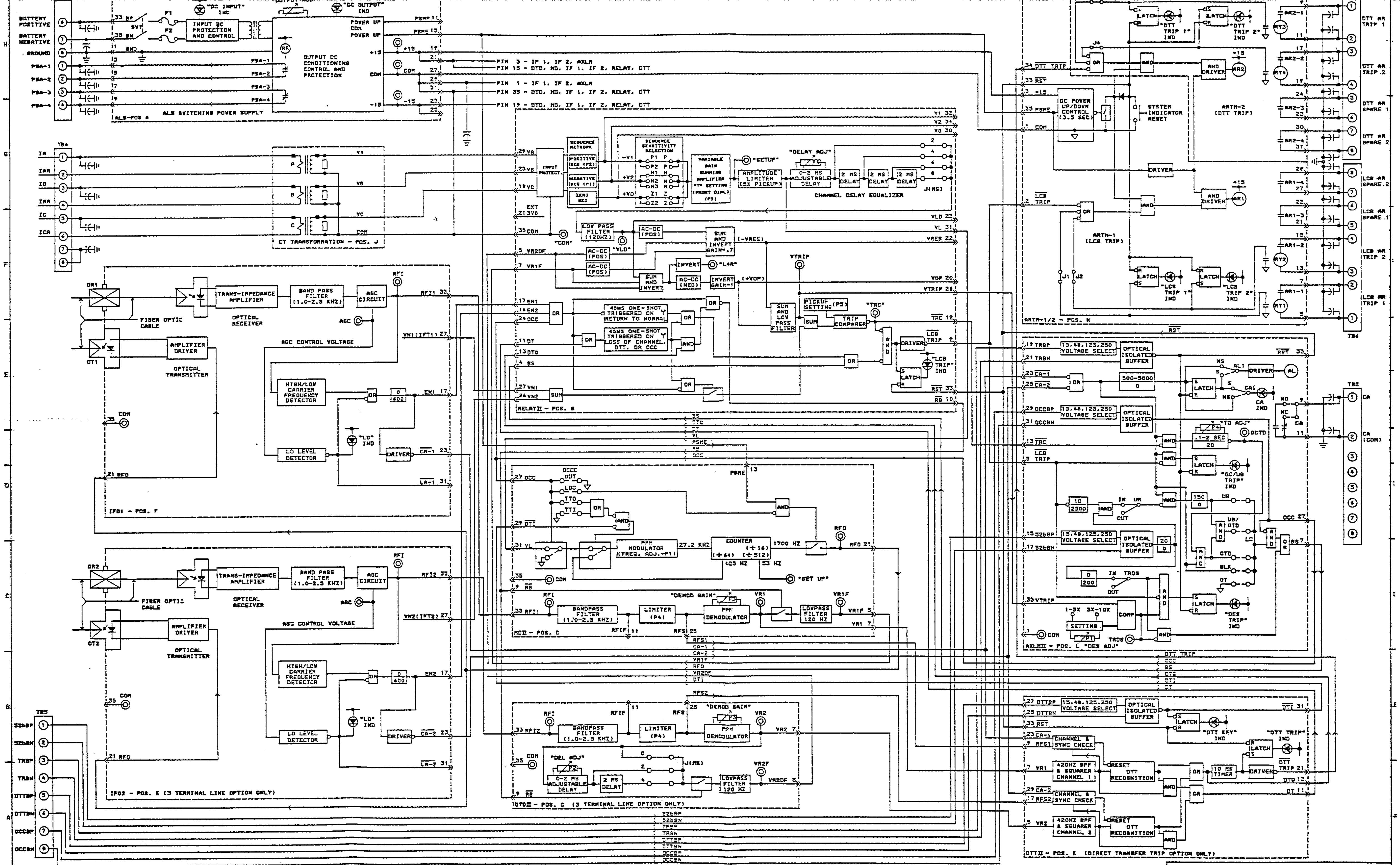
BATTERY POSITIVE
BATTERY NEGATIVE
GROUND
PSA-1
PSA-2
PSA-3
PSA-4
ALS-POS A
ALS SWITCHING POWER SUPPLY
"DC INPUT" IND
"OUTPUT ADJ"
"DC OUTPUT" IND
INPUT DC PROTECTION AND CONTROL
OUTPUT DC CONDITIONING CONTROL AND PROTECTION
POWER UP COM POWER UP
+15
COM
-15
PIN 3 - IF 1, IF 2, AXLR
PIN 15 - DTD, MD, IF 1, IF 2, RELAY, DTT
PIN 1 - IF 1, IF 2, AXLR
PIN 35 - DTD, MD, IF 1, IF 2, RELAY, DTT
PIN 19 - DTD, MD, IF 1, IF 2, RELAY, DTT
TB4
CT TRANSFORMATION - POS. J
INPUT PROTECT
SEQUENCE NETWORK
SEQUENCE SENSITIVITY SELECTION
VARIABLE GAIN SUMMING AMPLIFIER "T" SETTING (FRONT PANEL) (P3)
"SETUP"
"DELAY ADJ"
AMPLITUDE LIMITER (5X PICKUP)
0-2 MS ADJUSTABLE DELAY
12 MS DELAY
J(MS)
CHANNEL DELAY EQUALIZER
LOW PASS FILTER (120HZ)
AC-DC (POS)
AC-DC (NEG)
SUM AND INVERT
SUM AND LOW PASS FILTER
INVERT GAIN=1
PICKUP SETTING (P5)
TRIP COMPARER
"TRC"
"VLD"
"L+R"
"COM"
45MS ONE-SHOT TRIGGERED ON RETURN TO NORMAL
45MS ONE-SHOT TRIGGERED ON LOSS OF CHANNEL, DTT, OR OCC
RELAY II - POS. E
ARTM-1/2 - POS. R
ARTM-1 (LCB TRIP)
ARTM-2 (DTT TRIP)
DC POWER UP/DOWN CONTROL (3.5 SEC)
SYSTEM INDICATOR RESET
"DTT TRIP 1" IND
"DTT TRIP 2" IND
"LCB TRIP 1" IND
"LCB TRIP 2" IND
DTT-AR TRIP 1
DTT-AR TRIP 2
DTT-AR SPARE 1
DTT-AR SPARE 2
LCB-AR SPARE 2
LCB-AR SPARE 1
LCB-AR TRIP 2
LCB-AR TRIP 1
FIBER OPTIC CABLE
OPTICAL RECEIVER
TRANS-IMPEDANCE AMPLIFIER
BAND PASS FILTER (1.0-2.5 KHZ)
AGC CIRCUIT
AGC CONTROL VOLTAGE
OPTICAL TRANSMITTER
AMPLIFIER DRIVER
HIGH/LOW CARRIER FREQUENCY DETECTOR
LO LEVEL DETECTOR
"LO" IND
IFD1 - POS. F
SEQUENCE NETWORK
POSITIVE SEQ (P2)
NEGATIVE SEQ (P1)
ZERO SEQ
PPM MODULATOR (FREQ. ADJ.-P1)
27.2 KHZ
COUNTER (÷16) (÷64) (÷512)
1700 HZ
425 HZ
53 HZ
"SET UP"
"DEMOD GAIN"
BANDPASS FILTER (1.0-2.5 KHZ)
LIMITER (P4)
PPM DEMODULATOR
LOWPASS FILTER 120 HZ
MDII - POS. D
TRANSMIT & RECEIVE LOGIC
TRANSMIT LOGIC
RECEIVE LOGIC
52bBP
52bBN
TRBP
TRBN
DTTBP
DTTBN
OCCBP
OCCBN
TB5
115,48,125,250 VOLTAGE SELECT
OPTICAL ISOLATED BUFFER
300-3000
"TD ADJ"
.1-2 SEC
"DCTD"
"DC/UB TRIP" IND
"DES TRIP" IND
"DTT KEY" IND
"DTT TRIP" IND
CHANNEL & SYNC CHECK
420HZ BPF & SQUARER CHANNEL 1
RESET DTT RECOGNITION
10 MS TIMER
AXLNII - POS. L "DES ADJ"
DTTII - POS. K (DIRECT TRANSFER TRIP OPTION ONLY)

WIRING DWG. REF. - 1603C91
GENERAL DWG. REF. - 1352D70

MADE FROM DWG 2382F01

Westinghouse Electric Corporation
TYPE LCBII RELAY - BLOCK DIAGRAM
OPTICAL INTERFACE - 2 TERMINAL LINE
DRN. JME 2-20-85
DES. R.SOLER 2-10-85
2381F99
RELAY AND TELECOMMUNICATIONS DIV. CORAL SPRINGS, FL. U.S.A.
4033

MINOR REVISIONS. JME 2-20-85 RJS 2-28-85
MINOR REVISIONS. JME 12-6-85 R.SOLER 12-9-85
RE POTENTIOMETER REMOVED IN WALKII LOGIC. APS 2-12-86
"RE MS ONE-SHOT" ON RELAY MODULE WAS "9/24 MS TIMER" ISC 2-24-86
RELAY'S LOGIC: 10 MS ONE-SHOT WAS RE MS. JME 2-4-87



WIRING DWG. REF. - 1603C91
GENERAL DWG. REF. - 1332D78

3	1			A							A	P	A
A	P	V	33	35	36	37	40	41	42	43	44	46	

MADE FROM DWG 1757F96

1 905819 AC
2
MINOR REVISIONS. JME 5-20-85 RVB 6-6-85
3
MINOR REVISIONS. JME 12-4-85 N.BOLER 12-9-85
4
P2 POTENTIOMETER REMOVED IN AXLMII LOGIC. AFB 2-12-86
5
2 MS ONE SHOT IN RELAY MODULE WAS 0/22 MS TIMER GC 2-24-86
6
RELAY II LOGIC: 45 MS ONE-SHOT WAS 22 MS. JHS 8-4-87

Westinghouse Electric Corporation
TYPE LCBII RELAY - BLOCK DIAGRAM
OPTICAL INTERFACE - 3 TERMINAL LINE
DWN JME 2-4-85
APPD R.BOLER 2-10-85
2382F01
RELAY AND TELECOMMUNICATIONS DIV. CORAL SPRINGS, FL. U.S.A.
4053

BUS

A
B
C

52

LINE

1FT-1

CT TRANSFORMATION - POS. J

120VAC (USED ONLY FOR TESTING WITH OPTIONAL UCTB)

LCB TEST PANEL (OPTIONAL)

AUDIO INPUT #1

OUTPUT #1

ISOL. TRANSF.

SURGE PROT.

S.P. & ISOL. TRANSF.

SHIELDED TWISTED PAIR (TYPICAL)

XMTR #2

RCVR #2

32b KEYING

EXTERNAL RESET

DTT KEYING

OVERCURRENT CONTROL

LCBII RELAY

DEVICE NO.	DEVICE	DWG. NO.
87	LCBII RELAY	2398F07
TP	LCB TEST PANEL	1579C41
—	SP & ISOL TRANSF	4464D71
52a	CKT BKR AUX SW	———
52b	CKT BKR AUX SW	———
52T	CKT BKR TRIP COIL	———
86	LOCKOUT RELAY	———

LEGEND

- ◎ - TEST POINTS BROUGHT OUT TO FRONT PANEL
- △△ - A HIGH SIGNAL CAUSES ELECTRONIC SWITCH TO OPEN
- + - CUSTOMER SUPPLIED-SHIELDED TWISTED PAIR RECOMMENDED. POSITIVE VOLTAGE CAN BE 15V, 48V, 125V OR 250 VOLTS DC BY SELECTING APPROPRIATE LINK IN RESPECTIVE MODULE
- Ⓓ - TO APPROPRIATE MODULES

"DC INPUT" IND
"OUTPUT ADJ"
"DC OUTPUT" IND
INPUT DC PROTECTION AND CONTROL
OUTPUT DC CONDITIONING CONTROL AND PROTECTION
ALS - POS. A

SEQUENCE SENSITIVITY SELECTION
SEQUENCE NETWORK
VARIABLE GAIN SUMMING AMPLIFIER "T" SETTING (FRONT DIAL) POT P3
"SETUP"
0-8 MS ADJUSTABLE LOCAL DELAY
"VLD"
AC-DC
"L+R"
"VTRIP"
43 MS ONE-SHOT TRIGGERED ON RETURN TO NORMAL
43 MS ONE-SHOT TRIGGERED ON LOSS OF CHANNEL, DTT, OR OCC
PICKUP SETTING
TRIP COMPARISION
"TRC"
"LCB TRIP" IND
RELAY II - POS. G

PPM MODULATION CIRCUITRY
1.7 KHZ
"RFO"
"DEMOD GAIN"
"SETUP"
53 HZ
BANDPASS FILTER 1.0-2.5 KHZ
"RFI"
PPM DEMODULATION CIRCUITRY
MDII - POS. D

PROTECTION AND ISOLATION
RX "RX ADJ"
SCALING
ATT & AMP (LINKS)
COMMUNICATION CHANNEL INTERFACE CIRCUITRY
AGC IN RFI
"SNR" IND
"LO" IND
"HI" IND
CHANNEL CONDITION MONITOR
PILOT
"TX ADJ"
LEVEL CONTROL
CONDITIONING AND AMPLIFICATION
(LINKS)
PROTECTION AND ISOLATION
"XMTR OUT"
IFDT1 - POS. F

VOLTAGE SELECT
OPTICAL ISOLATED BUFFER
"DTT KEY" IND
420HZ DETECTOR
DTT DETECTION
10 MS TIMER
"DTT TRIP" IND
DTTII - POS. K (DIRECT TRANSFER TRIP OPTION)

DTT TRIP DECISION LOGIC
"DTT TRIP 1" IND
"DTT TRIP 2" IND
DRIVER
DC POWER UP/DOWN CONTROL AND RESET LOGIC
DTT OPTION ONLY
SYSTEM INDICATOR RESET
LCB TRIP DECISION LOGIC
"LCB TRIP 1" IND
"LCB TRIP 2" IND
ARTR-1/2 - POS. M

"TD ADJ"
.1-2 SEC
"CA" IND
"OC/UB TRIP" IND
UNBLOCK OVERCURRENT AND CHANNEL BLOCK LOGIC
"DES TRIP" IND
"DES ADJ"
AXLMII - POS. L

OTDII - POS. C (3 TERMINAL LINE OPTION)

IFDT2 - POS. E (3 TERMINAL LINE OPTION)

LCBII RELAY

LCB TEST PANEL (OPTIONAL)

BKR TRIP CKTS

LOCKOUT CKTS

CUST CKTS

ALARM CKTS

AVAILABLE WITH DTT OPTION

DIRECT TRANSFER TRIP

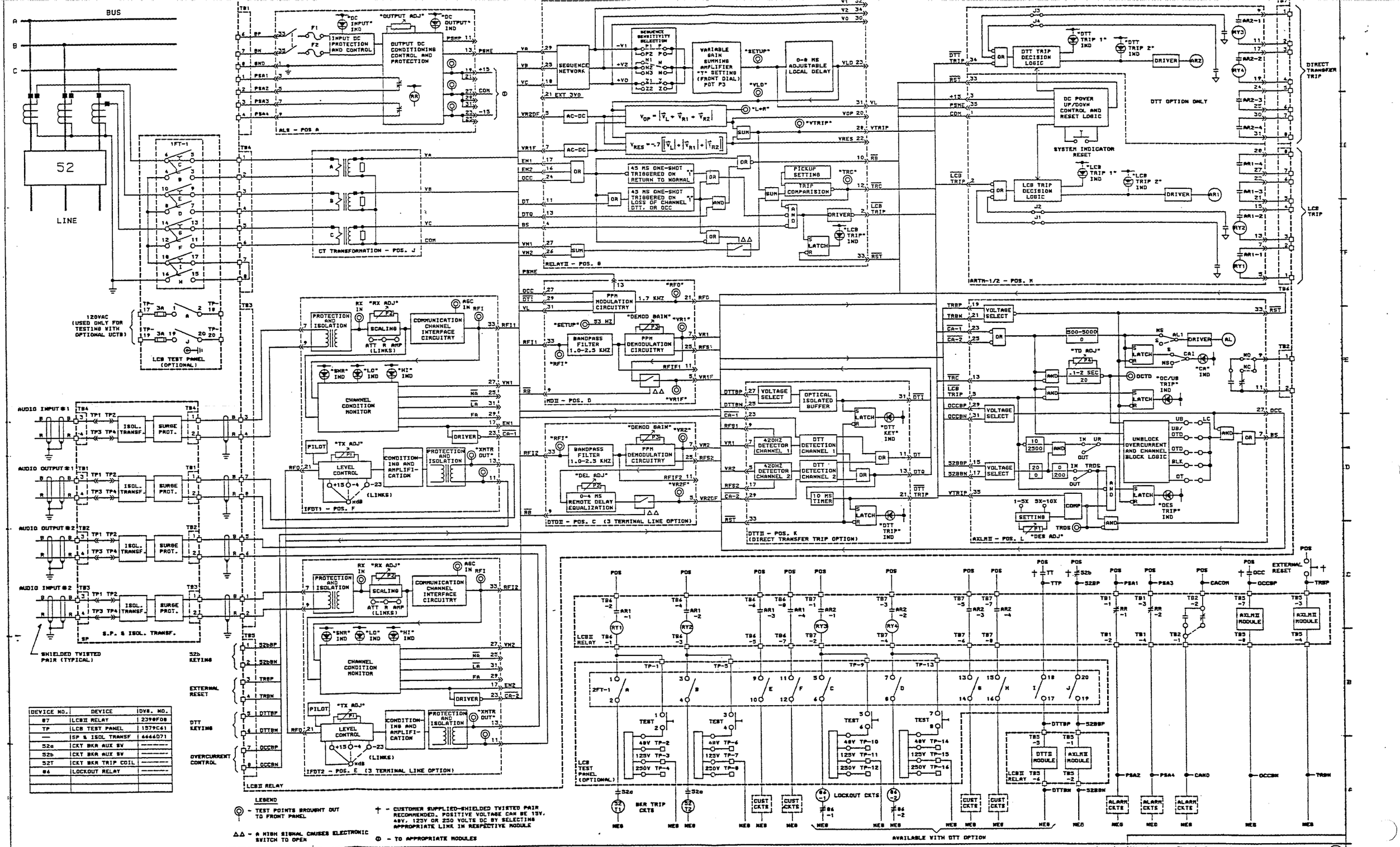
LCB TRIP

Westinghouse Electric Corporation
TYPE LCBII RELAY - SYSTEM SCHEMATIC
AUDIO TONE INTERFACE 2 TERMINAL LINE

DRWN AFS 1-28-87 APPD 2/26/87 5/6/87
2398F09
SHEET OF

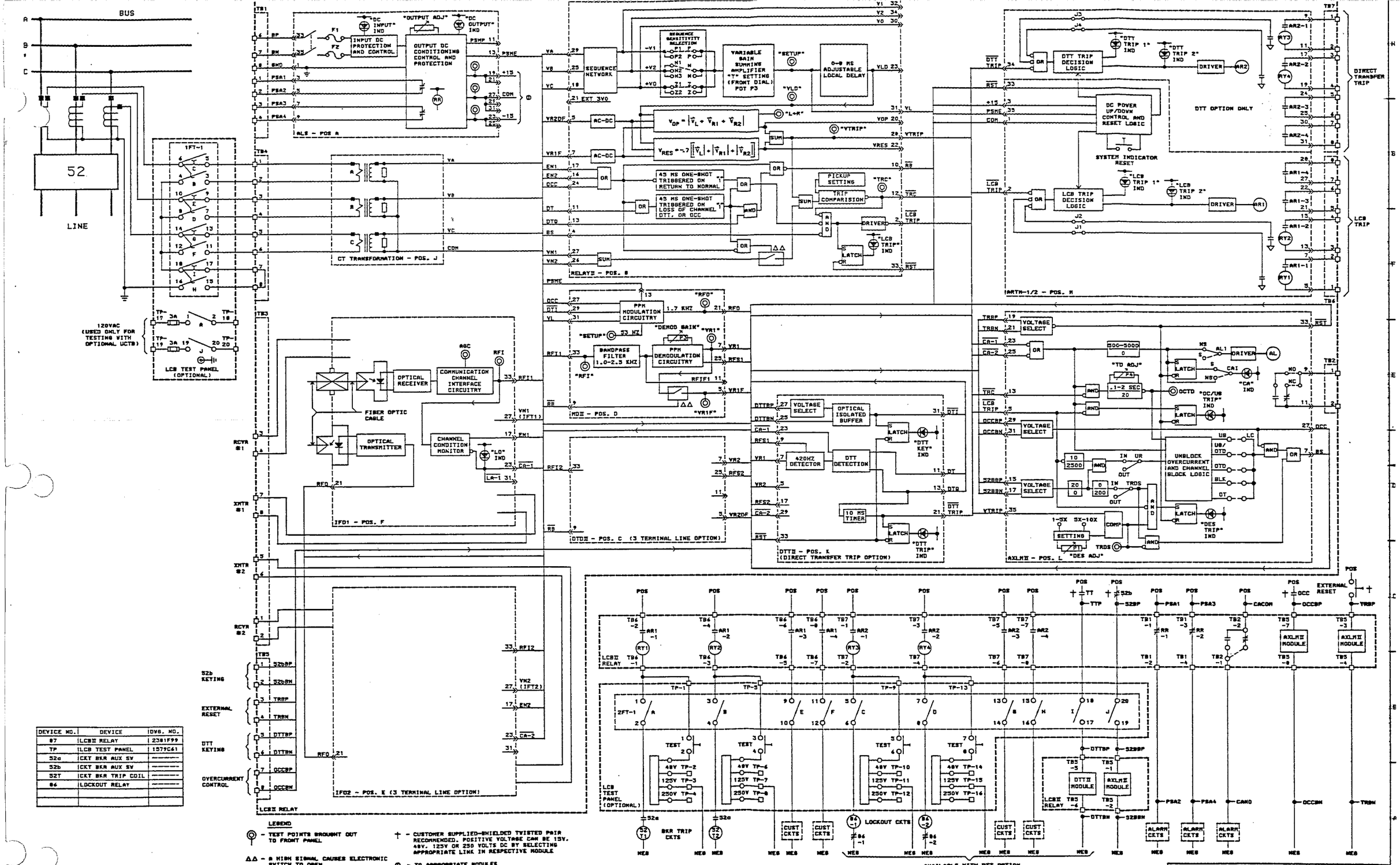
MADE FROM DWG 2303F21

RELAY AND TELECOMMUNICATIONS DIV. CORAL SPRINGS, FL. U.S.A. 4056



DEVICE NO.	DEVICE	DWG. NO.
87	LCBII RELAY	2398F08
TP	LCB TEST PANEL	1579C61
—	SP & ISOL TRANSF	6464D71
52a	CKT BKR AUX SW	———
52b	CKT BKR AUX SW	———
52T	CKT BKR TRIP COIL	———
86	LOCKOUT RELAY	———

Westinghouse Electric Corporation
TYPE LCBII RELAY - SYSTEM SCHEMATIC
AUDIO TONE INTERFACE 3 TERMINAL LINE
DRN AFS 1-28-91 CHK 2/5/91 APP 2/5/91
2398F10
MADE FROM DWG 2393Z22
RELAY AND TELECOMMUNICATIONS DIV., CORAL SPRINGS, FL, U.S.A.



DEVICE NO.	DEVICE	DWG. NO.
87	LCBII RELAY	2381F99
TP	LCB TEST PANEL	1579C61
52a	CKT BKR AUX SW	————
52b	CKT BKR AUX SW	————
52T	CKT BKR TRIP COIL	————
86	LOCKOUT RELAY	————

LEGEND

- ◎ - TEST POINTS BROUGHT OUT TO FRONT PANEL
- ΔΔ - A HIGH SIGNAL CAUSES ELECTRONIC SWITCH TO OPEN
- + - CUSTOMER SUPPLIED-SHIELDED TWISTED PAIR RECOMMENDED. POSITIVE VOLTAGE CAN BE 15V, 48V, 125V OR 250 VOLTS DC BY SELECTING APPROPRIATE LINK IN RESPECTIVE MODULE
- Φ - TO APPROPRIATE MODULES

REV	DATE	BY	CHK'D	APP'D	DESCRIPTION
10					
9					
8	8-21-89	JME			MINOR REVISIONS.
7	8-24-89	JLW			
6					RELAYII LOGIC: 45 MS ONE-SHOT TO 43 MS. LEGEND REVISED. TEST JACK ON 1FT-1 ADDED.
5	8-30-89				
4	8-5-91				

MADE FROM DWG 2363F24

Westinghouse Electric Corporation

TYPE LCBII RELAY - SYSTEM SCHEMATIC

OPTICAL INTERFACE 2 TERMINAL LINE

DRWN	CHKD	APPD	DATE
JME		DLWEISS	8-12-88

2383F23

RELAY AND TELECOMMUNICATIONS DIV. CORAL SPRINGS,FL. U.S.A. 4056

DEVICE NO.	DEVICE	DWG. NO.
87	LCBII RELAY	2382F01
TP	LCB TEST PANEL	1379C61
52a	CKT BKR AUX SW	———
52b	CKT BKR AUX SW	———
52T	CKT BKR TRIP COIL	———
86	LOCKOUT RELAY	———

LEGEND

⊙ - TEST POINTS BROUGHT OUT TO FRONT PANEL

△△ - A HIGH SIGNAL CAUSES ELECTRONIC SWITCH TO OPEN

† - CUSTOMER SUPPLIED-SHIELDED TWISTED PAIR RECOMMENDED. POSITIVE VOLTAGE CAN BE 13V, 48V, 125V OR 250 VOLTS DC BY SELECTING APPROPRIATE LINK IN RESPECTIVE MODULE

◎ - TO APPROPRIATE MODULES

AVAILABLE WITH DTT OPTION

Westinghouse Electric Corporation

TYPE LCBII RELAY - SYSTEM SCHEMATIC

OPTICAL INTERFACE 3 TERMINAL LINE

DWG. 2383F24

RELAY AND TELECOMMUNICATIONS DIV., CORAL SPRINGS, FL., U.S.A. 4054

1353D79

NOTE: ALL RESISTORS ARE 1/4W UNLESS OTHERWISE SPECIFIED.

DRAWING ROUTING CODE	A	P	V	F	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
SCHEMATIC	RELAY	IFDT MODULE	2

CAD/DWG
CHANGES TO BE MADE USING CAD PROCESS ONLY

Westinghouse Electric Corporation
TITLE INTERNAL SCHEMATIC - IFDT MODULE
RELAY TYPE LCB II

DFTM M. URIGUEN	2-6-87	APPD RWG	03-06-87
CHKR.		APPD	DWG. NO. 1353D79
		APPD	SHEET 1 OF 2

RELAY-TELECOMMUNICATIONS DIV.-CORAL SPRINGS, FLA., U.S.A. CODE 4055

NO	DESCRIPTION	DATE	APPROVED
D-905819	(NC) ON SH.2 R27 & R146 WERE NOT ON, R8 WAS .25W, R108 WAS 14.7K, R124 WAS 15.1K, R128 WAS 1.5K. M.U. 03-21-87	4-1-87	

1353D79

	CAPACITOR		
C01	3534A68H01	.001uF, 200V,1% POLYCARB	
C02	3534A68H01	.001uF, 200V,1% POLYCARB	
C03	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C04	3533A53H12	5600pF, 100V, 2% MET POLYCARB	
C05	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C06	3534A68H08	.1uF, 100V, 5% POLYCARB	
C07	3534A68H08	.1uF, 100V, 5% POLYCARB	
C08	3532A31H71	30pF, 300V, 5% DIPPED MICA	
C09	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C10	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C11	3534A68H05	.015uF, 200V, 2% MET POLYCARB	
C12	3533A53H11	4700pF, 100V, 2% MET POLYCARB	
C13	3533A53H05	2200pF, 400V, 2% POLYCARB	
C14	3526A65H01	.015uF, 200V, 1% POLYCARB	
C15	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C16	762A757H12	270pF, 500V, 5% MICA	
C17	3533A53H08	1500pF, 600V, 2% POLYCARB	
C18	3533A53H06	6800pF, 200V, 2% POLYCARB	
C19	3526A65H02	.031uF, 100V, 1% MET MYLAR	
C20	3532A31H98	620pF, 300V, 1% DIPPED MICA	
C21	3532A31H98	620pF, 300V, 1% DIPPED MICA	
C22	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C23	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C24	3532A31H98	620pF, 300V, 1% DIPPED MICA	
C25	3526A65H01	.015uF, 200V, 1% POLYCARB	
C26	3533A53H11	4700pF, 100V, 2% MET POLYCARB	
C27	3534A68H10	.22uF, 100V,5% POLYCARB	
C28	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C29	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C30	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C31	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C32	3534A68H10	.22uF, 100V,5% POLYCARB	
C33	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C34	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C35	3534A68H08	.1uF, 100V, 5% MET POLYCARB	
C36	3534A68H08	.1uF, 100V, 5% MET POLYCARB	
C37	3526A65H06	.47uF, 100V, 1% MET MYLAR	
C38	3526A65H06	.47uF, 100V, 1% MET MYLAR	
C39	3534A68H08	.1uF, 100V, 5% MET POLYCARB	
C40	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C41	863A166H16	.33uF, 50V, 5% MET POLYCARB	
C42	763A209H17	47pF, 500V, 2% MICA	
C43	3532A29H19	.01uF, 50V, 2% MONO CERAMIC	
C44	3534A68H11	1.0uF, 50V, 5% POLYCARB	
C45	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C46	763A209H03	10pF, 500V, 5% MICA	
C47	3534A68H08	.1uF, 100V, 5% POLYCARB	
C48	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C49	3534A68H08	.1uF, 100V, 5% MET POLYCARB	
C50	3534A68H08	.1uF, 100V, 5% MET POLYCARB	
C51	3534A68H01	.001uF, 200V,1% POLYCARB	
C52	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C53	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C54	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C55	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C56	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C57	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C58	3533A53H05	2200pF, 400V, 2% POLYCARB	
C59	3534A68H08	.1uF, 100V, 5% POLYCARB	
C60	3534A68H01	.001uF, 200V,1% POLYCARB	
C61	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C62	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C63	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C64	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C65	3534A68H08	.1uF, 100V, 5% POLYCARB	
C66	3534A68H08	.1uF, 100V, 5% POLYCARB	
C67	3534A68H01	.001uF, 200V,1% POLYCARB	
C68	3534A68H01	.001uF, 200V,1% POLYCARB	
C69	3534A68H01	.001uF, 200V,1% POLYCARB	
C70	3534A68H01	.001uF, 200V,1% POLYCARB	
C71	3534A68H01	.001uF, 200V,1% POLYCARB	
C72	3533A53H05	2200pF, 400V, 2% POLYCARB	
C73	3534A68H05	.015uF, 200V, 2% MET POLYCARB	
C74	3526A65H02	.031uF, 100V, 1% MET MYLAR	
C75	3533A53H02	.01uF, 200V, 2% MET POLYCARB	
C76	3533A53H03	.1uF, 50V, 2% MET POLYCARB	
C77	3534A68H01	.001uF, 200V,1% POLYCARB	
C78	3534A68H01	.001uF, 200V,1% POLYCARB	
C79	3534A68H08	.1uF, 100V, 5% POLYCARB	
C80	3534A68H01	.001uF, 200V,1% POLYCARB	
C81	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C82	3532A29H13	.1uF, 50V, 20% MONO CERAMIC	
C83	3533A53H03	.1uF, 50V, 2% MET POLYCARB	
C84	3534A68H11	1.0uF, 50V, 5% POLYCARB	
C85	3533A75H13	47uF, 35V, 20% DIPPED TANT.	
C86	3533A75H13	47uF, 35V, 20% DIPPED TANT.	

	POTENTIO	
P1	3527A30H05	2K, .75W, 10% TRIMPOT
P2	3527A30H04	20K, .75W, 10% TRIMPOT
P3	3534A25H05	2K, .5W, 10% (TOP ADJUST)
P4	3534A25H05	2K, .5W, 10% (TOP ADJUST)
P5	3523A42H02	20K, .5W, 10% (TOP ADJUST)

	RESISTOR	
R1	3535A37H77	61.9K, .25W, 1% METAL FILM
R2	3535A37H57	38.3K, .25W, 1% METAL FILM
R3	3535A39H01	100 OHM, .25W, 1% METAL FILM
R4	3535A37H37	23.7K, .25W, 1% METAL FILM
R5	3535A37H57	38.3K, .25W, 1% METAL FILM
R6	3535A37H23	16.9K, .25W, 1% METAL FILM
R7	3532A38H23	169K, .25W, 1% METAL FILM
R8	629A531H43	3.0K, .50W, 2% METAL FILM
R9	629A531H50	5.6K, .5W, 2% METAL FILM
R10	629A531H50	5.6K, .5W, 2% METAL FILM
R11	3535A37H30	20K, .25W, 1% METAL FILM
R12	3535A38H47	3.01K, .25W, 1% METAL FILM
R13	3535A37H30	20K, .25W, 1% METAL FILM
R14	3535A37H30	20K, .25W, 1% METAL FILM
R15	3535A37H30	20K, .25W, 1% METAL FILM
R16	3535A38H01	1K, .25W, 1% METAL FILM
R17	3535A37H13	13.3K, .25W, 1% METAL FILM
R18	3535A39H43	274 OHM, .25W, 1% METAL FILM
R19	3535A38H47	3.01K, .25W, 1% METAL FILM
R20	3535A38H44	2.8K, .25W, 1% METAL FILM
R21	3535A37H67	48.7K, .25W, 1% METAL FILM
R22	3535A38H83	7.15K, .25W, 1% METAL FILM
R23	3535A37H01	10K, .25W, 1% METAL FILM
R24	3532A38H34	221K, .25W, 1% METAL FILM
R25	3535A39H69	511 OHM, .25W, 1% METAL FILM
R26	3532A38H01	100K, .25W, 1% METAL FILM
R27	3535A38H21	1.62K, .25W, 1% METAL FILM
R28	3535A37H01	10K, .25W, 1% METAL FILM
R29	3532A38H01	100K, .25W, 1% METAL FILM
R30	3532A38H09	121K, .25W, 1% METAL FILM
R31	3532A38H06	113K, .25W, 1% METAL FILM
R32	3535A37H01	10K, .25W, 1% METAL FILM
R33	3535A37H01	10K, .25W, 1% METAL FILM
R34	3535A37H01	10K, .25W, 1% METAL FILM
R35	3532A38H09	121K, .25W, 1% METAL FILM
R36	3535A37H47	30.1K, .25W, 1% METAL FILM
R37	3535A39H85	750 OHM, .25W, 1% METAL FILM
R38	3535A39H13	133 OHM, .25W, 1% METAL FILM
R39	3535A38H77	6.19K, .25W, 1% METAL FILM
R40	629A531H27	620 OHM, .5W, 2% METAL FILM
R41	3535A37H01	10K, .25W, 1% METAL FILM
R42	3535A37H01	10K, .25W, 1% METAL FILM
R43	3535A38H52	4.32K, .25W, 1% METAL FILM
R44	3535A37H70	52.3K, .25w, 1% METAL FILM
R45	3535A37H02	10.2K, .25W, 1% METAL FILM
R46	3535A38H91	8.66K, .25W, 1% METAL FILM
R47	3535A38H89	8.25K, .25W, 1% METAL FILM
R48	3535A37H01	10K, .25W, 1% METAL FILM
R49	3535A37H59	51.1K, .25W, 1% METAL FILM
R50	3535A38H60	4.12K, .25W, 1% METAL FILM
R51	3535A37H01	10K, .25W, 1% METAL FILM
R52	3535A37H59	51.1K, .25W, 1% METAL FILM
R53	3535A37H73	56.2K, .25W, 1% METAL FILM
R54	3535A37H01	10K, .25W, 1% METAL FILM
R55	3535A37H01	10K, .25W, 1% METAL FILM
R56	3535A37H30	20K, .25W, 1% METAL FILM
R57	3535A41H53	1.5M, .25W, 5% METAL FILM
R58	3535A37H01	10K, .25W, 1% METAL FILM
R59	3535A38H90	8.45K, .25W, 1% METAL FILM
R60	3535A37H22	16.5K, .25W, 1% METAL FILM
R61	3535A37H23	16.9K, .25W, 1% METAL FILM
R62	3535A38H61	4.22K, .25W, 1% METAL FILM
R63	3535A37H62	43.2K, .25W, 1% METAL FILM
R64	3532A38H30	200K, .25W, 1% METAL FILM
R65	3535A37H01	10K, .25W, 1% METAL FILM
R66	3532A38H54	357K, .25W, 1% METAL FILM
R67	3535A37H18	15K, .25W, 1% METAL FILM
R68	3532A38H34	221K, .25W, 1% METAL FILM
R69	3535A38H30	2K, .25W, 1% METAL FILM
R70	3535A37H13	13.3K, .25W, 1% METAL FILM
R71	3532A38H59	511K, .25W, 1% METAL FILM
R72	3535A37H18	15K, .25W, 1% METAL FILM
R73	3532A38H18	150K, .25W, 1% METAL FILM
R74	3535A37H58	49.9K, .25W, 1% METAL FILM
R75	3535A37H89	82.5K, .25W, 1% METAL FILM
R76	3532A38H13	133K, .25W, 1% METAL FILM
R77	3535A37H59	51.1K, .25W, 1% METAL FILM
R78	3535A37H59	51.1K, .25W, 1% METAL FILM
C87	3534A68H08	.1uF, 100V, 5% POLYCARB
C88	3533A75H13	47uF, 35V, 20% DIPPED TANT.
C89	3533A75H13	47uF, 35V, 20% DIPPED TANT.
C90	837A241H15	1uF, 35V, 10% SOLID TANTALUM
C91	837A241H15	1uF, 35V, 10% SOLID TANTALUM
C92	3534A68H08	.1uF, 100V, 5% MET POLYCARB
C93	3534A68H08	.1uF, 100V, 5% POLYCARB
C94	3534A68H08	.1uF, 100V, 5% POLYCARB
C95	3533A53H02	.01uF, 200V, 2% MET POLYCARB
C96	3533A53H02	.01uF, 200V, 2% MET POLYCARB
C97	3526A65H06	.47uF, 100V, 1% MET MYLAR
C98	3526A65H06	.47uF, 100V, 1% MET MYLAR

	DIODE	
D1	3508A22H01	RED LED (FRT MOUNT)
D2	3508A22H01	RED LED (FRT MOUNT)
D3	3508A22H01	RED LED (FRT MOUNT)
D4	3508A22H04	RED LED (TOP MOUNT)
D6	836A928H01	1N4148 DIODE
D7	837A652H03	1N645A DIODE
D8	837A652H03	1N645A DIODE
D9	836A928H01	1N4148 DIODE
D10	836A928H01	1N4148 DIODE
D11	836A928H01	1N4148 DIODE
D12	836A928H01	1N4148 DIODE
D13	836A928H01	1N4148 DIODE
D14	836A928H01	1N4148 DIODE
D15	836A928H01	1N4148 DIODE
D16	836A928H01	1N4148 DIODE
D17	836A928H01	1N4148 DIODE
D18	836A928H01	1N4148 DIODE
D19	836A928H01	1N4148 DIODE
D20	836A928H01	1N4148 DIODE
D21	836A928H01	1N4148 DIODE
D22	836A928H01	1N4148 DIODE
D23	836A928H01	1N4148 DIODE
D24	836A928H01	1N4148 DIODE
D25	836A928H01	1N4148 DIODE
D26	836A928H01	1N4148 DIODE
D27	836A928H01	1N4148 DIODE

	INT CKT	
IC01	3528A90H02	TL072IJ DUAL OP AMP
IC02	3528A90H01	TL074IJ QUAD OP AMP
IC03	3528A90H01	TL074IJ QUAD OP AMP
IC04	3534A29H02	RC4156 QUAD OP-AMP
IC05	3533A21H01	CA3080AS OP TRANSCOND AMP
IC06	3536A27H02	MC14569 PROGRAMMABLE CONTR.
IC07	9642A78H01	PXO-1000 PROG. CRYSTAL OSC.
IC08	3527A09H01	MC14530 BAL DUAL MONO MULTIVIB
IC09	3527A26H06	MC14013 DUAL D-FLIP FLOP
IC10	3536A27H02	MC14569 PROGRAMMABLE CONTR.
IC11	3527A09H01	MC14530 BAL DUAL MONO MULTIVIB
IC12	3534A29H02	RC4156 QUAD OP-AMP
IC13	3528A90H01	TL074IJ QUAD OP AMP
IC14	3528A90H01	TL074IJ QUAD OP AMP
IC15	3527A09H06	MC14066 BAL QUAD BILATERAL SW
IC16	3527A09H02	MC14011 QUAD NAND GATE
IC17	3528A90H01	TL074IJ QUAD OP AMP
IC18	3534A39H01	5V REGULATOR

R79	3532A38H01	100K, .25W, 1% METAL FILM
R80	3535A38H85	7.5K, .25W, 1% METAL FILM
R81	3535A39H77	619 OHM, .25W, 1% METAL FILM
R82	3532A38H19	154K, .25W, 1% METAL FILM
R83	3535A37H56	37.4K, .25W, 1% METAL FILM
R84	3535A38H21	1.62K, .25W, 1% METAL FILM
R85	3532A38H19	154K, .25W, 1% METAL FILM
R86	3535A37H30	20K, .25W, 1% METAL FILM
R87	3532A38H48	309K, .25W, 1% METAL FILM
R88	3532A38H25	178K, .25W, 1% METAL FILM
R89	3535A41H50	1.18M, .25W, 5% METAL FILM
R90	3532A38H01	100K, .25W, 1% METAL FILM
R91	3535A37H01	10K, .25W, 1% METAL FILM
R92	3535A37H22	16.5K, .25W, 1% METAL FILM
R93	3535A37H85	75K, .25W, 1% METAL FILM
R94	3535A37H76	68.4K, .25W, 1% METAL FILM
R95	3535A37H84	73.2K, .25W, 1% METAL FILM
R96	3535A38H82	8.87K, .25W, 1% METAL FILM
R97	3535A38H47	3.01K, .25W, 1% METAL FILM
R98	3532A38H08	118K, .25W, 1% METAL FILM
R99	3535A37H46	29.4K, .25W, 1% METAL FILM
R100	3535A37H40	25.5K, .25W, 1% METAL FILM
R101	3535A38H68	4.99K, .25W, 1% METAL FILM
R102	3535A39H47	301 OHM, .25W, 1% METAL FILM
R103	3532A38H01	100K, .25W, 1% METAL FILM
R104	3535A37H01	10K, .25W, 1% METAL FILM
R105	3535A39H47	301 OHM, .25W, 1% METAL FILM
R106	3535A41H56	2M, .25W, 5% METAL FILM
R107	3535A37H69	51.1K, .25W, 1% METAL FILM
R108	3535A37H32	21K, .25W, 1% METAL FILM
R109	3535A37H30	20K, .25W, 1% METAL FILM
R110	3535A37H30	20K, .25W, 1% METAL FILM
R111	3535A38H85	7.5K, .25W, 1% METAL FILM
R112	3535A37H01	10K, .25W, 1% METAL FILM
R113	3535A37H43	27.4K, .25W, 1% METAL FILM
R114	3535A37H30	20K, .25W, 1% METAL FILM
R115	3535A37H69	51.1K, .25W, 1% METAL FILM
R116	3535A41H65	4.7M, .25W, 5% METAL FILM
R117	3532A38H09	121K, .25W, 1% METAL FILM
R118	3532A38H08	118K, .25W, 1% METAL FILM
R119	3535A37H46	29.4K, .25W, 1% METAL FILM
R120	3535A39H47	301 OHM, .25W, 1% METAL FILM
R121	3535A39H47	301 OHM, .25W, 1% METAL FILM
R122	3535A38H85	7.5K, .25W, 1% METAL FILM
R123	3535A41H53	1.5M, .25W, 5% METAL FILM
R124	3535A37H01	10K, .25W, 1% METAL FILM
R125	3535A37H01	10K, .25W, 1% METAL FILM
R126	3535A37H72	54.9K, .25W, 1% METAL FILM
R127	3535A38H85	7.5K, .25W, 1% METAL FILM
R128	3535A41H53	1.5M, .25W, 5% METAL FILM
R129	3532A38H30	200K, .25W, 1% METAL FILM
R130	3532A38H01	100K, .25W, 1% METAL FILM
R131	3535A37H01	10K, .25W, 1% METAL FILM
R132	3535A38H47	3.01K, .25W, 1% METAL FILM
R133	3532A38H01	100K, .25W, 1% METAL FILM
R134	3535A41H56	2M, .25W, 5% METAL FILM
R135	3532A38H01	100K, .25W, 1% METAL FILM
R136	3535A39H18	150 OHM, .25W, 1% METAL FILM
R137	3532A38H01	100K, .25W, 1% METAL FILM
R138	3532A38H01	100K, .25W, 1% METAL FILM
R139	3535A38H58	3.92K, .25W, 1% METAL FILM
R140	3532A38H09	121K, .25W, 1% METAL FILM
R141	187A290H31	2.7 OHM, .5W, 5% CARBON
R142	187A290H31	2.7 OHM, .5W, 5% CARBON
R143	187A290H31	2.7 OHM, .5W, 5% CARBON
R144	187A290H31	2.7 OHM, .5W, 5% CARBON
R145	3535A39H77	619 OHM, .25W, 1% METAL FILM
R146	3535A37H30	20K, .25W, 1% METAL FILM

	TRANSFORMER	
T1	3534A75H01	MT26-PC(600 OHM MATCHING)
T2	3534A75H01	MT26-PC(600 OHM MATCHING)

	TRANSISTOR	
Q1	762A672H11	TRANSISTOR 2N2219A, NPN
Q2	762A672H10	TRANSISTOR 2N2905A, PNP

	VARISTOR	
MV1	3509A31H04	(C14DK220) 20-24 VDC @ 1MA, 0.1W
MV2	3509A31H04	(C14DK220) 20-24 VDC @ 1MA, 0.1W

DRAWING ROUTING CODE: A P V F | 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
SCHEMATIC	RELAY	IFDT MODULE	2

CAD/DWG
CHANGES TO BE MADE USING CAD PROCESS ONLY

Westinghouse Electric Corporation
TITLE INTERNAL SCHEMATIC - IFDT MODULE
RELAY TYPE LCB II

DFTM M.URIGUEN | 2-05-1987 | APPD
CHKR. | APPD
APPD
DWG. NO. 1353D79
SHEET 2 OF 2

RELAY-TELECOMMUNICATIONS DIV.-CORAL SPRINGS, FLA.,U.S.A. CODE 4055

SO D-905819 REV 1 2

1352D88

SHIELD CAN

* = 0Ω FOR G01 & G02

OPTICAL RECEIVER

OR-1

OUTPUT CONNECTOR

TRANS-IMPEDANCE AMPLIFIER

1.0 KHZ - 2.5 KHZ BPF

OPTICAL TRANSMITTER

OT-1

CHANNEL/SIGNAL MONITOR

AGC

"LO" LEVEL IND.

TO ALARM IND.

NOTES:

ALL RESISTORS ARE 1/4W UNLESS OTHERWISE SPECIFIED.

REF: MODULE ASSEMBLY - 1605C05G01 - SMA CONNECTORS
- 1605C05G02 - "AMP OPTIMATE" CONNECTORS
- 1605C05G03 - 1300nM OPTION

COMPONENT LOCATION - 1494B65

DRAWING ROUTING CODE	3	1					A							A	P	A
	A	P	V	F	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
SCHEMATIC	RELAY	IFO II MOD. - LCB II	3

50	905819	
2	ICN-2509 WAS OLD TRACING. (G03 WAS NOT ON) (CR5,134 ETC C41,456 (G01 WAS NOT ON) M.U. 1-9-87	
3	ICN-2544 C16 WAS CONNECTED TO COMMON. M.U. 02-13-87	

CAD/DWG
CHANGES TO BE MADE USING CAD PROCESS ONLY
MADE FROM DWG. 1349D36

1585C06

Westinghouse Electric Corporation
TITLE LCB II RELAY
OPTICAL INTERFACE MODULE II (IFO II)

DFTM M.URIGUEN 01-29-87 APPD
CHKR. APPD
APPD

DWG. NO. 1352D88
SHEET 1 OF 2

RELAY-TELECOMMUNICATIONS DIV.-CORAL SPRINGS, FLA.,U.S.A. CODE 4055

1352D88

ITEM	PART NAME	DESCRIPTION	STYLE NO.
C01	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C02	CAPACITOR	.022 MFD 100V +/-2% MET POLY CARB	3533A53H01
C03	CAPACITOR	1.0 MFD 50V +/-5% MET POLY CARB	3534A68H11
C04	CAPACITOR	.015 MFD 100V +/-2% MET POLY CARB	3534A68H05
C05	CAPACITOR	.001 MFD 200V +/-1% MET POLY CARB	3534A68H01
C06	CAPACITOR	270 PF 500V +/-2% MICA	762A757H12
C07	CAPACITOR	.022 MFD 100V +.-2% MET POLY CARB	3533A53H01
C08	CAPACITOR	.0015 MFD 600V +/-2% MET POLY CARB	3533A53H08
C09	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C10	CAPACITOR	300 PF 500V +/-2% MICA	187A584H09
C11	CAPACITOR	.22 MFD 100V +/-5% MET POLY CARB	3534A68H10
C12	CAPACITOR	.22 MFD 100V +/-5% MET POLY CARB	3534A68H10
C13	CAPACITOR	.33 MFD 50V +/-5% MET-POLY CARB	863A166H16
C14	CAPACITOR	10 PF 500V +/-5% MICA	763A209H03
C15	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C16	CAPACITOR	1.0 MFD 50V +/-5% MET POLY CARB	3534A68H11
C17	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C18	CAPACITOR	.01 MFD 200V +/-2% MET POLY CARB	3533A53H02
C19	CAPACITOR	100 MFD 35V +/-20% TANTALUM	880A363H01
C20	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C21	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C22	CAPACITOR	100 MFD 35V +/-20% TANTALUM	880A363H01
C23	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C24	CAPACITOR	1 MFD 35V +/-10% TANTALUM	837A241H15
C25	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C26	CAPACITOR	100 MFD 35V +/-20% TANTALUM	880A363H01
C27	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C28	CAPACITOR	1 MFD 35V +/-10% TANTALUM	837A241H58
C29	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C30	CAPACITOR	.1 MFD 100V +/-5% MET POLY CARB	3534A68H08
C31	CAPACITOR	47 PF 500V +/-2% MICA	763A209H17
C32	CAPACITOR	.0022 MFD 2% 400V MET POLY CARB	3533A53H05
C33	CAPACITOR	.22 MFD 100V +/-5% MET POLY CARB	3534A68H10
⊖C34	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C35	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C36	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C37	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C38	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C39	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C40	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
C41	CAPACITOR	0.1 MFD 50V 20% MONO CERAMIC	3532A29H13
D01	DIODE	1N4148 75V	836A928H06
D02	DIODE	1N4148 75V	836A928H06
D03	DIODE	1N4148 75V	836A928H06
D04	DIODE	1N4148 75V	836A928H06
D05	DIODE	1N4148 75V	836A928H06
D06	DIODE	1N4148 75V	836A928H06
D07	DIODE	1N645A 225V	837A692H03
D08	DIODE	1N4148 75V	836A928H06
D09	DIODE	1N645A 225V	837A692H03
D10	DIODE	1N4148 75V	836A928H06
D11	DIODE	1N4148 75V	836A928H06
D12	DIODE	1N645A 225V	837A692H03
IC01	INT CKT	TL0741J QUAD OP AMP MULTIVIB	3528A90H01
IC02	INT CKT	TL0741J QUAD OP AMP MULTIVIB	3528A90H01
IC03	INT CKT	HC14538BAL DUAL PREC MONO MULTIVIB	3527A09H01
IC04	INT CKT	CA3080AS OP TRANSCOND AMP	3533A21H01
IC05	INT CKT	TL0741J QUAD OP AMP	3528A90H01
LED-1	DIODE	RED LED (EDGE MOUNT)	3508A22H01
△OR-1	DIODE	SPX-4692-002 SPECTRONICS DETECTOR	3534A77H02
△OT-1	DIODE	SPX-4689-004 SPECTRONICS EMITTER	3534A77H01
△FOC	CABLE	100/140 UM 9 INCH FIBER OPTIC CABLE	1586C73G01
□OR-1	DIODE	HFD 3804-2 HONEYWELL DETECTOR	9644A71H02
□OT-1	DIODE	HFE 4800-4 HONEYWELL EMITTER	9644A71H01
⊖□FOC	CABLE	100/140 UM 9 INCH FIBER OPTIC CABLE	1604C71G01
⊖OR-1	DIODE	FUJITSU FID 13532WX DETECTOR SMA	9647A37G02
⊖OT-1	DIODE	FUJITSU FED 130K2WD EMITTER SMA	9647A37G01

ITEM	PART NAME	DESCRIPTION	STYLE NO.
R01	RESISTOR	619K 1/4W 1% METAL FILM	848A822H19
R02	RESISTOR	301K 1/4W 1% METAL FILM	848A821H88
R03	RESISTOR	16.2K 1/4W 1% METAL FILM	848A820H65
R04	RESISTOR	301K 1/4W 1% METAL FILM	848A821H88
R05	RESISTOR	1.5K 1% 1/4W METAL FILM	848A819H65
R06	RESISTOR	100K 1/4W 1% METAL FILM	848A821H42
R07	RESISTOR	3.92K 1/4W 1% METAL FILM	848A820H06
R08	RESISTOR	121K 1/4W 1% METAL FILM	848A821H50
R09	RESISTOR	121K 1/4W 1% METAL FILM	848A821H50
R10	RESISTOR	8.25K 1/4W 1% METAL FILM	848A820H37
R11	RESISTOR	100K 1/4W 1% METAL FILM	848A821H42
R12	RESISTOR	100K 1/4W 1% METAL FILM	848A821H42
R13	RESISTOR	200K 1/4W 1% METAL FILM	848A821H71
R14	RESISTOR	56.2K 1/4W 1% METAL FILM	848A821H18
R15	RESISTOR	51.1K 1/4W 1% METAL FILM	848A821H14
R16	RESISTOR	10K 1/4W 1% METAL FILM	848A820H45
R17	RESISTOR	357K 1% 1/4W METAL FILM	848A821H95
R18	RESISTOR	200K 1/4W 1% METAL FILM	848A821H71
R19	RESISTOR	221K 1% 1/4W METAL FILM	848A821H75
R20	RESISTOR	13.3K 1% 1/4W METAL FILM	848A820H57
R21	RESISTOR	511K 1/4W 1% METAL FILM	848A822H11
R22	RESISTOR	15K 1/4W 1% METAL FILM	848A820H62
R23	RESISTOR	15K 1/4W 1% METAL FILM	848A820H62
R24	RESISTOR	4.7 MEG 5% 1/2W CARBON	187A290H28
R25	RESISTOR	17.8K 1% 1/4W METAL FIIM	848A820H69
R26	RESISTOR	27.4K 1% 1/4W METAL FIIM	848A820H87
R27	RESISTOR	2.0 MEG 5% 1/2W CARBON	187A290H30
R28	RESISTOR	100K 1/4W 1% METAL FIIM	848A821H42
R29	RESISTOR	6.19K 1/4W 1% METAL FIIM	848A820H25
R30	RESISTOR	7.5K 1/4W 1% METAL FIIM	848A820H33
R31	RESISTOR	200K 1/4W 1% METAL FIIM	848A821H71
R32	RESISTOR	51.1K 1/4W 1% METAL FIIM	848A821H14
R33	RESISTOR	51.1K 1/4W 1% METAL FIIM	848A821H14
R34	RESISTOR	82.5K 1% 1/4W METAL FIIM	848A821H34
R35	RESISTOR	20 OHM 1/2W 5% CARBON	187A290H08
R36	RESISTOR	220 OHM 2W 5% MOLD. COMP.	185A207H11
R37	RESISTOR	220 OHM 2W 5% MOLD. COMP.	185A207H11
R38	RESISTOR	301 OHM 1% 1/4W METAL FILM	848A818H97
R39	RESISTOR	10 OHM 1/2W +/-5% CARBON	187A290H01
R40	RESISTOR	10 OHM 1/2W +/-5% CARBON	187A290H01
R41	RESISTOR	7.5K 1/4W 1% METAL FIIM	848A820H33
R42	RESISTOR	10 OHM 1/2W +/-5% CARBON	187A290H01
R43	RESISTOR	10 OHM 1/2W +/-5% CARBON	187A290H01
R44	RESISTOR	178K 1/4W 1% METAL FIIM	848A821H66
R45	RESISTOR	301 OHM 1% 1/4W METAL FILM	848A818H97
R46	RESISTOR	2.2 MEG 5% 1/2W CARBON	187A290H26
R47	RESISTOR	100K 1/4W 1% METAL FILM	848A821H42
R48	RESISTOR	200K 1/4W 1% METAL FILM	848A821H71
R49	RESISTOR	2.0 MEG 5% 1/2W CARBON	187A290H30
R50	RESISTOR	7.5K 1/4W 1% METAL FILM	848A820H33
R51	RESISTOR	3.01K 1% 1/4W METAL FIIM	848A819H94
R52	RESISTOR	3.01K 1% 1/4W METAL FIIM	848A819H94
R53	RESISTOR	15K 1/4W 1% METAL FILM	848A820H62
R54	RESISTOR	7.5K 1/4W 1% METAL FILM	848A820H33
R55	RESISTOR	7.5K 1/4W 1% METAL FILM	848A820H33
⊖R56	RESISTOR	10K 1% 1/4W METAL FILM	848A820H45
⊖R57	RESISTOR	5.11K 1% 1/4W METAL FIIM	848A820H17
Q01	TRANSISTOR	2N2222A NPN	762A672H15
Z01	DIODE	1N961B 10V 5% 400MW	186A797H07

□=FOR G01 ONLY

△=FOR G02 ONLY

⊖=FOR G03 ONLY

DRAWING ROUTING CODE: A P V F | 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
SCHEMATIC	RELAY	OPTICAL INTERFACE	23

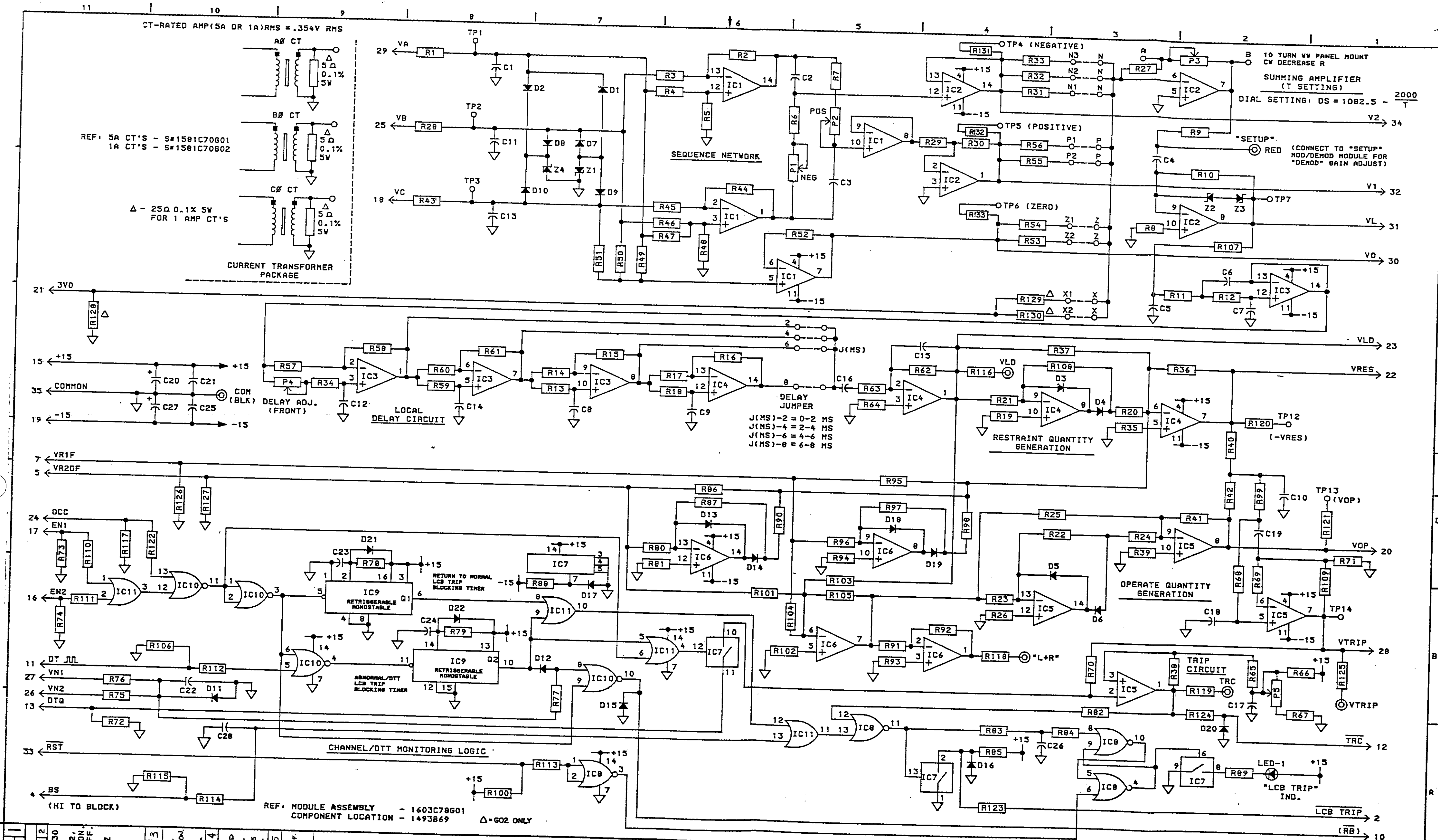
Westinghouse Electric Corporation

TITLE LCB II RELAY
OPTICAL INTERFACE MODULE

DFTM M. URIGUEN	01-20-1987	APPD	DWG. NO. 1352D88
CHKR.		APPD	SHEET 2 OF 2
		APPD	

RELAY AND TELECOMMUNICATIONS DIV. - CORAL SPRINGS, FLORIDA, U.S.A. CODE 4055

1	10	9019
2	9	9119
3		



2	R126 THRU R130 WERE NOT ON. PINS 21,30,32, 34 WERE NOT ON. J(MS) WAS DIFF. SHEET 2 - J(MS),N,P & Z WERE NOT ON. JME 5-20-85	
3	SYM. "Δ" FOR G02 ONLY" WAS NOT ON. SMC 5-30-85	
4	ICN-1991 R131, 132, & 133 AND C18 WERE NOT ON. 12-30-85	
5	ICN-2505 ON SH 2, R29 WAS 221K SW 3532A38H34. 1-6-87	

3	1			A						A	P	A
A	P	V	33	35	36	37	40	41	42	43	44	46

MADE FROM DWG 1349D34
1585C07

Westinghouse Electric Corporation

TITLE LCB II RELAY

RELAY MODULE II (RELAY II)

DRWN KJB 1-3-83

APPD R.SOLER 2-3-83

DWG. NO. 1351D97

SHEET 1 OF 2

RELAY AND TELECOMMUNICATIONS DIV. CORAL SPRINGS, FL. U.S.A. 4055

1351D97

CAPACITOR		STYLE
C01	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C02	.022 MFD 100V +-2% MET-POLY CARB	3533A53H01
C03	.01 MFD 200V +-2% MET-POLY CARB	3533A53H02
C04	1.0 MFD 50V +-5% MET-POLY CARB	3534A68H11
C05	.1 MFD 50V +-2% MET-POLY CARB	3533A53H03
C06	.047 MFD 100V +-5% MET-POLY CARB	3534A68H07
C07	.01 MFD 200V +-2% MET-POLY CARB	3533A53H02
C08	.01 MFD 200V +-2% MET-POLY CARB	3533A53H02
C09	.01 MFD 200V +-2% MET-POLY CARB	3533A53H02
C10	.22 MFD 100V 5% MET-POLY CARB	3534A68H10
C11	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C12	.012 MFD 200V +-5% MET-POLY CARB	3534A68H04
C13	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C14	.01 MFD 200V +-2% MET-POLY CARB	3533A53H02
C15	.0068 MFD 200V +-2% MET-POLY CARB	3533A53H06
C16	.047 MFD 100V +-5% MET-POLY CARB	3534A68H07
C17	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C18	.1 MFD 50V +-2% MET-POLY CARB	3533A53H03
C19	.15 MFD 100V +-5% MET-POLY CARB	3534A68H09
C20	18 MFD 35V +-5% TANTALUM	862A530H12
C21	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C22	510 PF 500V +-2% MICA	861A846H19
C23	.1 MFD 50V +-2% MET-POLY CARB	3533A53H03
C24	.1 MFD 50V +-2% MET-POLY CARB	3533A53H03
C25	.1 MFD 100V +-5% MET-POLY CARB	3534A68H08
C26	.0047 MFD 200V +-5% MYLAR	3502A85H09
C27	10 MFD 35V +-5% TANTALUM	862A530H12
C28	270 PF, 500V ±2%, DUR-MICA	762A757H12

DIODE		STYLE
D01	1N645A 225V	837A692H03
D02	1N645A 225V	837A692H03
D03	1N4148 75V	836A928H06
D04	1N4148 75V	836A928H06
D05	1N4148 75V	836A928H06
D06	1N4148 75V	836A928H06
D07	1N645A 225V	837A692H03
D08	1N645A 225V	837A692H03
D09	1N645A 225V	837A692H03
D10	1N645A 225V	837A692H03
D11	1N4148 75V	836A928H06
D12	1N4148 75V	836A928H06
D13	1N4148 75V	836A928H06
D14	1N4148 75V	836A928H06
D15	1N645A 225V	837A692H03
D16	1N645A 225V	837A692H03
D17	1N4148A 75V	836A928H06
D18	1N4148A 75V	836A928H06
D19	1N4148A 75V	836A928H06
D20	1N645A 225V	837A692H03
D21	1N4148 75V	836A928H06
D22	1N4148 75V	836A928H06

DIAL		STYLE
DIAL	DIGITAL DIAL	3609A12H03

INT CKT		STYLE
IC01	TL074IJ QUAD OP AMP	3528A90H01
IC02	TL074IJ QUAD OP AMP	3528A90H01
IC03	TL074IJ QUAD OP AMP	3528A90H01
IC04	TL074IJ QUAD OP AMP	3528A90H01
IC05	TL074IJ QUAD OP AMP	3528A90H01
IC06	TL074IJ QUAD OP AMP	3528A90H01
IC07	MC14066BAL QUAD BILATERAL SWITCH	3527A09H06
IC08	MC14001BAL QUAD 2-INPUT NOR	3533A17H01
IC09	MC14538BAL DUAL PREC MONO MULTIVIB	3527A09H01
IC10	MC14001BAL QUAD 2-INPUT NOR	3533A17H01
IC11	MC14071BAL QUAD 2-INPUT OR	3537A15H04

DIODE		STYLE
LED-1	RED LED (EDGE MOUNT)	3608A22H01

POT		STYLE
P01	100K 3/4W 10% TRIMPOT	3527A38H07
P02	100K 3/4W 10% TRIMPOT	3527A38H07
P03	100K 2W 10 TURN 5% PREC POT	3509A13H04
P04	100K 3/4W 10% TRIMPOT	3527A38H07
P05	1K 3/4W 10% TRIMPOT	3527A38H09

RESISTOR		STYLE
R001	300 OHM 2% 1/2W METAL GLAZE	629A531H19
R002	100K 1/8W 1% METAL FILM	3532A38H01
R003	301K 1/4W .1% METAL FILM	3534A73H01
R004	301K 1/4W .1% METAL FILM	3534A73H01
R005	100K 1/8W 1% METAL FILM	3532A38H01
R006	178K 1/8W 1% METAL FILM	3532A38H25
R007	115K 1/8W 1% METAL FILM	3532A38H07
R008	100K 1/8W 1% METAL FILM	3532A38H01
R009	100K 1/8W 1% METAL FILM	3532A38H01
R010	100K 1/8W 1% METAL FILM	3532A38H01
R011	75K 1% 1/8W METAL FILM	3535A37H85
R012	75K 1% 1/8W METAL FILM	3535A37H85
R013	100K 1/8W 1% METAL FILM	3532A38H01
R014	200K 1% 1/8W METAL FILM	3532A38H30
R015	200K 1% 1/8W METAL FILM	3532A38H30
R016	200K 1% 1/8W METAL FILM	3532A38H30
R017	200K 1% 1/8W METAL FILM	3532A38H30
R018	100K 1/8W 1% METAL FILM	3532A38H01
R019	100K 1/8W 1% METAL FILM	3532A38H01
R020	100K 1/8W 1% METAL FILM	3532A38H01
R021	200K 1% 1/8W METAL FILM	3532A38H30
R022	200K 1% 1/8W METAL FILM	3532A38H30
R023	200K 1% 1/8W METAL FILM	3532A38H30
R024	100K 1/8W 1% METAL FILM	3532A38H01
R025	200K 1/8W 1% METAL FILM	3532A38H30
R026	100K 1/8W 1% METAL FILM	3532A38H01
R027	8.25K 1/4W 1% METAL FILM	848A820H37
R028	300 OHM 2% 1/2W METAL GLAZE	629A531H19
R029	100K 1/8W 1% METAL FILM	3532A38H01
R030	100K 1/8W 1% METAL FILM	3532A38H01
R031	4.32K 1/4W 1% METAL FILM	848A820H10
R032	4.53K 1/4W 1% METAL FILM	848A820H12
R033	4.99K 1/4W 1% METAL FILM	848A820H16
R034	1K 1% 1/4W METAL FILM	848A819H48
R035	24.3K 1/8W 1% METAL FILM	3535A37H38
R036	100K 1/8W 1% METAL FILM	3532A38H01
R037	200K 1% 1/8W METAL FILM	3532A38H30
R038	2.0 MEG 5% 1/2W CARBON	187A290H38
R039	51.1K 1/8W 1% METAL FILM	3535A37H69
R040	61.9K 1/8W 1% METAL FILM	3535A37H77
R041	200K 1% 1/8W METAL FILM	3532A38H30
R042	61.9K 1/8W 1% METAL FILM	3535A37H77
R043	300 OHM 2% 1/2W METAL GLAZE	629A531H19
R044	200K 1% 1/8W METAL FILM	3532A38H30
R045	301K 1/4W .1% METAL FILM	3534A73H01
R046	301K 1/4W .1% METAL FILM	3534A73H01
R047	301K 1/4W .1% METAL FILM	3534A73H01
R048	100K 1/8W 1% METAL FILM	3532A38H01
R049	301K .1% 1/4W METAL FILM	3534A73H01
R050	301K .1% 1/4W METAL FILM	3534A73H01
R051	301K .1% 1/4W METAL FILM	3534A73H01
R052	100K 1/8W 1% METAL FILM	3532A38H01
R053	806 OHM 1/4W 1% METAL FILM	848A819H39
R054	412 OHM 1/4W 1% METAL FILM	848A819H11
R055	20K 1% 1/8W METAL FILM	3535A37H30
R056	10K 1/8W 1% METAL FILM	3535A37H01
R057	200K 1% 1/8W METAL FILM	3532A38H30
R058	200K 1% 1/8W METAL FILM	3532A38H30
R059	100K 1/8W 1% METAL FILM	3532A38H01
R060	200K 1% 1/8W METAL FILM	3532A38H30
R061	200K 1% 1/8W METAL FILM	3532A38H30
R062	150K 1% 1/8W METAL FILM	3532A38H18
R063	301K 1/8W 1% METAL FILM	3532A38H47
R064	150K 1% 1/8W METAL FILM	3532A38H18
R065	10K 1/8W 1% METAL FILM	3535A37H01
R066	15K 1/8W 1% METAL FILM	3535A37H18
R067	100 OHM 1% 1/8W METAL FILM	3535A39H01
R068	30.1K 1% 1/8W METAL FILM	3535A37H47
R069	162K 1% 1/8W METAL FILM	3532A38H21
R070	5.11K 1/4W 1% METAL FILM	848A820H17
R071	2K 1% 1/8W METAL FILM	3535A38H30
R072	200K 1/8W 1% METAL FILM	3532A38H30
R073	100K 1/8W 1% METAL FILM	3532A38H01
R074	100K 1/8W 1% METAL FILM	3532A38H01
R075	150K 1% 1/8W METAL FILM	3532A38H18
R076	150K 1% 1/8W METAL FILM	3532A38H18
R077	100K 1/8W 1% METAL FILM	3532A38H01
R078	221K 1% 1/8W METAL FILM	3532A38H34
R079	442K 1% 1/8W METAL FILM	3532A38H65
R080	200K 1/8W 1% METAL FILM	3532A38H30
R081	100K 1% 1/8W METAL FILM	3532A38H01
R082	100K 1/8W 1% METAL FILM	3532A38H01
R083	200K 1% 1/8W METAL FILM	3532A38H30
R084	10K 1/8W 1% METAL FILM	3535A37H01
R085	10K 1/8W 1% METAL FILM	3535A37H01
R086	200K 1% 1/8W METAL FILM	3532A38H30
R087	200K 1% 1/8W METAL FILM	3532A38H30
R088	3.01K 1/4W 1% METAL FILM	848A819H94
R089	3.01K 1/4W 1% METAL FILM	848A819H94
R090	100K 1/8W 1% METAL FILM	3532A38H01
R091	200K 1/8W 1% METAL FILM	3532A38H30
R092	200K 1/8W 1% METAL FILM	3532A38H30
R093	100K 1/8W 1% METAL FILM	3532A38H01
R094	100K 1/8W 1% METAL FILM	3532A38H01
R095	200K 1% 1/8W METAL FILM	3532A38H30
R096	200K 1% 1/8W METAL FILM	3532A38H30
R097	200K 1% 1/8W METAL FILM	3532A38H30
R098	100K 1/8W 1% METAL FILM	3532A38H01
R099	100K 1/8W 1% METAL FILM	3532A38H01
R100	51.1K 1/8W 1% METAL FILM	3535A37H69
R101	200K 1/8W 1% METAL FILM	3532A38H30
R102	75K 1% 1/8W METAL FILM	3535A37H85
R103	200K 1% 1/8W METAL FILM	3532A38H30
R104	200K 1% 1/8W METAL FILM	3532A38H30
R105	140K 1% 1/8W METAL FILM	3532A38H15
R106	100K 1% 1/8W METAL FILM	3532A38H01
R107	9.09K 1% 1/8W METAL FILM	3535A38H93
R108	200K 1% 1/8W METAL FILM	3532A38H30
R109	162KL/8W 1% METAL FILM	3535A37H21
R110	10K 1/8W 1% METAL FILM	3535A37H01
R111	10K 1/8W 1% METAL FILM	3535A37H01
R112	10K 1/8W 1% METAL FILM	3535A37H01
R113	10K 1/8W 1% METAL FILM	3535A37H01
R114	10K 1/8W 1% METAL FILM	3535A37H01
R115	100K 1/8W 1% METAL FILM	3532A38H01
R116	3.01K 1% 1/8W METAL FILM	3535A38H47
R117	100K 1/8W 1% METAL FILM	3532A38H01
R118	3.01K 1% 1/8W METAL FILM	3535A38H47
R119	3.01K 1% 1/8W METAL FILM	3535A38H47
R120	3.01K 1% 1/8W METAL FILM	3535A38H47
R121	3.01K 1% 1/8W METAL FILM	3535A38H47
R122	10K 1/8W 1% METAL FILM	3535A37H01
R123	499 OHM 1/2W 1% METAL FILM	848A819H19
R124	7.5K 1/8W 1% METAL FILM	3535A38H85
R125	3.01K 1/8W 1% METAL FILM	3535A38H47
R126	30.1K 1/4W 1% METAL FILM	3535A37H47
R127	30.1K 1/4W 1% METAL FILM	3535A37H47
R128	30.1K 1/4W 1% METAL FILM	3535A37H47 } △
R129	412Ω 1/4W 1% METAL FILM	848A819H11 }
R130	20.0K 1/8W 1% METAL FILM	3535A37H30
R131	3.01K 1/4W 1% METAL FILM	3535A38H47
R132	3.01K 1/4W 1% METAL FILM	3535A38H47
R133	3.01K 1/4W 1% METAL FILM	3535A38H47

ZENER		STYLE
Z01	1N759A 12V 5% 400 MW	837A693H01
Z02	1N961B 10V 5% 400 MW	186A797H07
Z03	1N961B 10V 5% 400 MW	186A797H07
Z04	1N759A 12V 5% 400 MW	837A693H01

LINK		STYLE
J(MS)	BLUE CLIP LINK	3532A54H01
N	BLUE CLIP LINK	3532A54H01
P	BLUE CLIP LINK	3532A54H01
R	BLUE CLIP LINK	3532A54H01
X	BLUE CLIP LINK	3532A54H01 △

DRAWING ROUTING CODE: A P V F 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
SCHEMATIC	RELAY	LCB RELAY II	5

Westinghouse Electric Corporation

TITLE LCB II RELAY
RELAY MODULE II

DFTM J.J. Campo 7-6-83 APPD
CHKR APPD M. Lebo 7/11/83 DWG. NO. 1351D97
APPD SHEET 2 OF 2

RELAY-INSTRUMENT DIV. - CORAL SPRINGS, FLORIDA, U.S.A. CAGE 4055

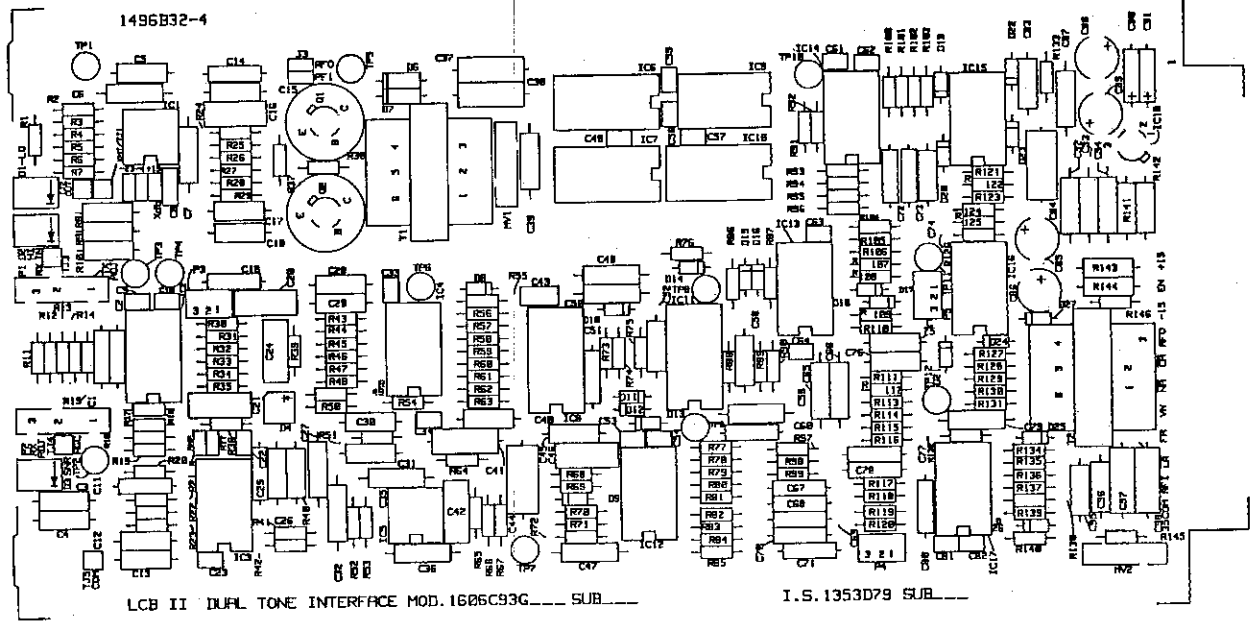
DATE 1585C07

905819

1 2 3 4 5

11 10 9 8 7 6 5 4 3 2 1

1496B32



146487-B-14

SILK SCREEN

±.005
10.500

DRAWING ROUTING CODE	R	P	V	F		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
PC BOARD	RELAY	IFDT MODULE	4

Westinghouse Electric Corporation

TITLE DRILL DWG. - RELAY TYPE LCB II
DUAL TONE INTERFACE MOFULE (IFDT)
SILK SCREEN

DFTM M.URIGUEN	06-17-1986	APPD	
CHKR.		APPD	
		APPD	

DWG. NO. 1496B32
SHEET 5 OF 7

ENGR. REF. DWG.

RELAY-TELECOMMUMICATIONS DIV.-CORAL SPRINGS, FLA.,U.S.A.

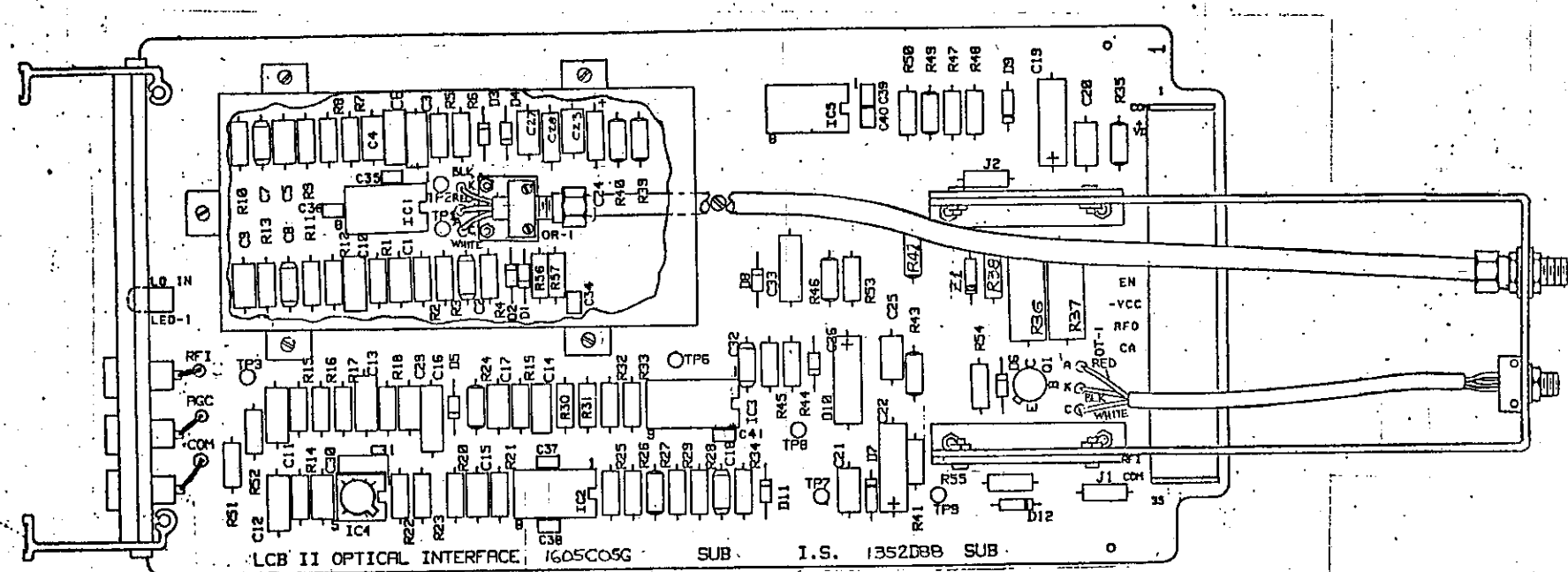
CODE 4055

1	3	4
SO D-905819		NC

1494B65

COMPONENT LOCATION

OPTICAL INTERFACE MODULE (IFO)
RELAY TYPE LCB II



DRAWING ROUTING CODE																		
	A	P	V	F		33	34	35	36	37	38	39	P 40	41	42	43	44	A 45	46	47

PART NAME	APPAR. TYPE	PART DESCRIPTION	SUB
COMP LOC	RELAY	OP INTERFACE MODULE-LCE	X2

DFTM RWL	Verif.	APPD PWB	4/1/85	DWG. NO. 1494B65	
CHKR.		APPD M. Jale	4/7/85	SHEET 1 OF 1	
		APPD			

Westinghouse Electric Corporation
TITLE COMPONENT LOCATION
OPTICAL INTERFACE MODULE-RELAY TYPE LCB II

ENGR. REF. DWG. 1605C05

RELAY-INSTRUMENT DIV. - CORAL SPRINGS, FLORIDA, U.S.A. 4055

SO 1A D-905879 (3) 1C 2D
IDN-2508 C34 TO C41, R56 & R57 WERE NOT ON. JWH 1-19-87 PWB 1-23-87