

CIVIL AIR DEFENSE WARNING SYSTEM

TWO-WAY SIGNALING REPEATERS

COMMON SYSTEMS

1. GENERAL

1.01 This section describes methods for testing the 2-way balanced loop signaling repeater J99237H (SD-95681-01) and the 2-way open-closed loop signaling repeater J99237J (SD-95682-01) used on the main sections of the civil air defense warning (CADW) system.

1.02 This section is reissued to cover:

- (a) The changes required by the fact that the 2-way repeaters may be arranged for one-way operation.
- (b) The changes required by the fact that the dial pulse receiving circuits have been modified to cause them to bring in the office alarms on single pulses.
- (c) The addition of a procedure in Test A to check the earth potential compensating feature of the repeaters.

Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 The tests and features covered are:

A. Two-way Pulsing Test Between Adjacent Offices - Per Cent Break Measurements

This test checks the operation of the 2-way signaling repeaters by sending continuous pulses into a repeater in one office and measuring the percent break of the pulses delivered by the repeater in the next office. The test is then repeated in the reverse direction.

B. Two-way Pulsing Test Between Adjacent Offices - Lamp Indications

This test checks the operation of the 2-way signaling repeaters by sending dial pulses into a repeater in one office and observing on a lamp the pulses delivered by the repeater in the next office. The test is then repeated in the reverse direction.

Note: Test B should be made only when apparatus for making Test A is not available.

C. Alarm Test

This test checks the alarm features associated with the repeaters used in Test A or B.

1.04 In order to save words, the phrase "dial pulse receiving unit" will be used as a generic expression covering the "code generator and dial pulse receiving unit" and the "dial pulse receiving and control units."

1.05 These tests require the services of an employee at the CADW bay in each of the two offices where the repeaters under test are located (see 3.01), and the provision of a talking circuit for their use while the tests are in progress. In addition, the services of an employee to go to the CADW bay and retire the alarms at the beginning and end of the tests are required in all of the other offices (see 3.02).

1.06 When a dial pulse receiving unit is located in an unattended office, local practices for retiring the alarms shall be followed.

1.07 Caution: To promote prompt attention for trouble conditions on the system, the alarm facilities are now arranged to bring in the office alarms when ANY pulse is received by a dial pulse receiving circuit. It is important, therefore, that extreme care be exercised at all times to avoid introducing even a momentary false pulse while working on the lines or equipment associated with the system. The same care should, of course, be taken to prevent the false transmission of any of the alert codes.

1.08 WARNING: When making the tests covered in this BSP, some part of the network is out of service. Permission MUST be obtained from the telephone company CADW network control supervisor before any tests are performed on this equipment, in order that the control supervisor may take whatever action is necessary to provide warnings in the isolated areas if an alert should occur at that time. All other telephone company personnel who may be concerned shall be informed when tests are to be conducted, and both the control supervisor and other concerned telephone company personnel shall be informed when the tests are completed and the equipment is restored to service.

1.09 Test A should be made only when the office batteries measure between 48.5 and 50 volts at both offices.

1.10 Lettered Steps: The letters a, b, c, etc., are added to a step number to indicate that the step covers an action which may or may not be required, depending upon local conditions. The conditions under which a lettered step, or series of steps, should be made are given in the action column; and all steps governed by the same condition are designated by the same letter. Where a condition does not apply, the associated steps should be omitted.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. Test A requires one set of apparatus per column I, II, or III at each office. Test B requires one set of apparatus per column B at each office, and Test C requires one set of apparatus per column C at each office. The details for each item are covered in the indicated paragraphs.

- 2.02 Signaling test unit J99237AA (SD-95696-01).
- 2.03 SXS pulsing test set J34717A (SD-31481-01).
- 2.04 SXS pulse repeating test set J34720A (SD-31667-01).
- 2.05 Toll pulse repeating test set J64722A (SD-64540-01).
- 2.06 2A signaling test set J64730A (SD-56134-01), or 2B signaling test set J64730B (SD-56134-02).
- 2.07 1A signaling test set J94727A (SD-95442-01).
- 2.08 36B test set (remote control).
- 2.09 P3E cord, 6 feet long, equipped with two No. 310 plugs (3P7A cord).
- 2.10 P3E cord, 10 feet long, equipped with two No. 310 plugs (3P6F cord).
- 2.11 P2J cord, 6 feet long, equipped with two No. 310 plugs (2P9B cord).
- 2.12 P2J cord, 9 feet long, equipped with two No. 310 plugs (2P9A cord).
- 2.13 P3K cord, 12 feet long, equipped with two No. 310 plugs (3P15B cord).
- 2.14 P4N cord, 4 feet long, equipped with two No. 289B plugs (4P8A cord).
- 2.15 No. 258D plug (dummy).
- 2.16 No. 310 plug with tip and ring shorted.
- 2.17 No. 716E or No. 528 receiver attached to a W2AB cord equipped with two No. 360A tools (2W21A cord), a No. 411A tool and a KS-6278 tool.

2.18 Earth potential test circuit consisting of two KS-6571 batteries and two S3B cords, 6 feet long, each equipped with one No. 310 plug. These items shall be connected as follows:

First Battery: + terminal to white lead of first cord and — terminal to white lead of second cord.

Second Battery: + terminal to blue lead of first cord and — terminal to blue lead of second cord.

Caution: Do not let the tips or rings of the two plugs touch each other.

Table A

Apparatus	No. Required for Test				
	A (See Note)	B	C		
	I	II	III		
Test Unit (2.02)	1	1	1	1	1
Test Set (2.03)	1	1	-	-	-
Test Set (2.04)	1	-	-	-	-
Test Set (2.05)	-	1	-	-	-
Test Set (2.06)	-	-	1	-	-
Test Set (2.07)	-	-	-	1	-
Test Set (2.08)	1	1	-	-	-
Patching Cord (2.09)	2	2	3	5	2
Patching Cord (2.10)	-	2	-	-	-
Patching Cord (2.11)	2	1	-	-	-
Patching Cord (2.12)	-	1	-	-	-
Patching Cord (2.13)	2	-	-	-	-
Patching Cord (2.14)	-	1	-	-	-
Dummy Plug (2.15)	-	-	1	-	1
Shorted Plug (2.16)	1	-	-	-	-
Test Receiver (2.17)	-	-	-	-	1
Earth Potential Test Ckt (2.18)	1*	1*	1*	-	-

*Not required at office having repeater arranged for one-way operation.

Note:

Use column I when SXS pulse repeating test set is available.

Use column II when toll pulse repeating test set is available.

Use column III when 2A or 2B signaling test set is available.

3. PREPARATION

3.01 The 2-way signaling repeaters cannot be tested individually, but must be checked in pairs over the line with which they are associated. For convenience, the two offices in which the pair are located will be identified as office "A" and office "B."

3.02 Because of the fact that the office alarms are brought in whenever a dial pulse receiving circuit receives even a single pulse, all offices having such circuits will receive the following alarm indications at the beginning and end of the tests:

MAJOR alarm will sound
 ALM lamp on dial pulse receiving unit will light
 WD lamp on dial pulse checking unit will light
 ALM lamp on alarm unit may light

For offices "A" and "B" these effects are treated as part of the tests and are listed in detail under the different steps. For the other offices, where they are merely incidental side effects, they are covered only by references to this paragraph. An employee in each of the latter offices can retire them at his convenience by:

- (a) Operating the CA key on the dial pulse receiving unit.

- (b) Operating the WD key on the dial pulse checking unit.
 (c) Operating the CA key on the alarm unit.

3.03 Before test connections can be made to a balanced loop repeater, it is necessary to know whether the repeater is wired for "X" option or for "Y" option. If this information has not been marked on the unit, it can be determined from the terminal strip as follows:

- (a) If terminals 31 and 32 are strapped, the repeater is wired for "X" option.
 (b) If terminals 30 and 32 are strapped, the repeater is wired for "Y" option.

STEPACTIONVERIFICATIONFor All Tests - At Offices "A" and "B"

- 1 Block relay A on repeater operated
- 2a If repeater is balanced-loop type with "X" option -
 Insert plug of a P3E cord in X jack of test unit and insert plug of another P3E cord in H1 jack of test unit

Gl lamp on test unit lights

- 3a Plug free end of cord connected to X jack into TST-S jack of repeater and plug free end of cord connected to H1 jack into LP jack of repeater

MAJOR alarm sounds
 ALM lamp on dial pulse receiving unit lights
 WD lamp on dial pulse checking unit lights

Caution: To prevent the possible transmission of false alerts, do not take down these connections until it has been determined that the test sets at both offices have been disconnected from the test units as covered in step 63 for Test A or step 18 for Test B.

Note: This step causes alarms in other offices (see 3.02).

- 4b If repeater is balanced-loop type with "Y" option -
 Insert plug of a P3E cord in Y jack of test unit and insert plug of another P3E cord in H1 jack of test unit

Gl lamp on test unit lights

- 5b Plug free end of cord connected to Y jack into TST-S jack of repeater and plug free end of cord connected to H1 jack in LP jack of repeater

MAJOR alarm sounds
 ALM lamp on dial pulse receiving unit lights
 WD lamp on dial pulse checking unit lights

Caution: Same as for step 3a.

Note: This step causes alarms in other offices (see 3.02).

- 6c If repeater is open-closed loop type -
 Insert one plug of P3E cord in OC jack of test unit and insert one plug of another P3E cord in H2 jack of test unit

Gl lamp on test unit lights

- 7c Plug free end of cord connected to OC jack into EQ2 jack of repeater and plug free end of cord connected to H2 jack into LP jack of repeater

MAJOR alarm sounds
 ALM lamp on dial pulse receiving circuit lights
 WD lamp on dial pulse checking unit lights

Caution: Same as for step 3a.

Note: This step causes alarms in other offices (see 3.02).

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<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
8	Operate CA key on dial pulse receiving unit	MAJOR alarm is silenced ALM lamp is extinguished
9	Operate WD key on dial pulse checking unit	WD lamp is extinguished

4. METHOD

<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
<u>A. Two-way Pulsing Test Between Adjacent Offices - Percent Break Measurements</u>		
<u>At Offices Using SXS Pulsing Test Set and SXS Pulse Repeating Test Set (Table A, Col I)</u>		

- 10 Patch BAT G jack of pulsing test set and BAT G jack of pulse repeating test set to TST BAT 48V jacks on test and alarm cut-off unit, using P2J cords

Caution: To avoid blowing fuses, connect to test sets first.

- 11 Insert plug of 36B test set (remote control) into A and B jacks of pulsing test set

- 12 Patch TL jack of pulsing test set to INT jack of pulse repeating test set, using P3K cord

- 13 Patch RLY jack of pulse repeating test set to CAL jack of test unit, using P3K cord

- 14 Check that PERCENT BREAK meter reads 100 on the scale. (This is its no current position.) If necessary, bring the reading to 100 by means of the zero adjusting screw on the meter

- 15 Operate SL key of pulse repeating test set BY lamp on pulse repeating test set lights

- 16 Insert short circuited plug in SW jack of pulsing test set

- 17 Adjust R1 control of pulse repeating test set to make PERCENT BREAK meter read 0

- 18d If pulsing test set has a PR key - Operate it

- 19e If pulsing test set does not have a PR key - Operate CHK PLS key

- 20 Remove short circuited plug from SW jack of pulsing test set

- 21 Start pulses by momentarily operating LK key of remote control test set PERCENT BREAK meter reads 60-61
If step 19e has been used -
BY lamp on pulsing test set flashes

- 22 Move plug from CAL jack to TS jack of test unit

Note: To recheck 0 reading of PERCENT BREAK meter, return plug to CAL jack and repeat steps 16, 17, and 20.

- 23 Proceed as in steps 57 to 70p

<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
<u>At Offices Using SXS Pulsing Test Set and Toll Pulse Repeating Test Set (Table A, Col II)</u>		
24	Patch BAT G jack of pulsing test set and BAT jack of pulse repeating test set to TST BAT 48V jacks on test and alarm cut-off unit, using P2J cords <u>Caution: To avoid blowing fuses, connect to the test sets first.</u>	
25	Patch A and B jacks of pulse repeating test set to A and B jacks, respectively, of pulsing test set, using P4N cord	
26	Insert plug of 36B test set (remote control) into A1 and B1 jacks of pulse repeating test set	
27	Patch TL jack of pulsing test set to INT jack of pulse repeating test set, using P3E cord	
28	Check that PERCENT BREAK meter reads 100 on the scale. (This is its no current position.) If necessary, bring the reading to 100 by means of the zero adjusting screw on the meter	
29f	If pulsing test set has a PR key - Operate it	
30g	If pulsing test set does not have a PR key - Operate CHK PLS key	
31	Operate DS key of pulse repeating test set	
32	Patch RLY jack of pulse repeating test set to CAL jack of test unit, using P3E cord	
33h	If pulse repeating test set has an SC key - Operate it and hold it through step 35	
34i	If pulse repeating test set does not have an SC key - Operate ADJ key and hold it through step 35	
35	Adjust ADJ control of pulse repeating test set to make PERCENT BREAK meter read 0	
36	Start pulses by momentarily operating LK key of remote control test set	If step 30g has been used - BY lamp on pulsing test set flashes
37	Adjust LK control of pulse repeating test set to make PERCENT BREAK meter read 50	
38	Move plug from CAL jack to TS jack of test unit <u>Note: To recheck 0 and 50 readings on PERCENT BREAK meter, return plug to CAL jack and repeat steps 33h to 37, as required.</u>	
39	Proceed as in steps 57 to 70p	

STEP	ACTION	VERIFICATION
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At Offices Using 2A or 2B Signaling Test Set (Table A, Col III)

40	Insert plugs of TST BAT A and TST BAT B cords which are part of the test set in TST BAT A and TST BAT B jacks, respectively, on test and alarm cutoff unit	If 2B set is being used - L and D lamps in test set light
41	Set SCALE SEL switch to PPS	
42	Allow test set to warm up for one minute	
43j	If 2B signaling test set is being used - Operate DIAL PLS key	PULSES PER SECOND meter reads 0 PERCENT BREAK meter reads 0 on its <u>black</u> scale If necessary, bring each reading to 0 by means of the zero adjusting screw on the meter involved
44k	If 2A signaling test set is being used - Operate DIAL SUPV key	
45	Patch L jack of test set to CAL jack of test unit, using P3E cord	
46	Operate PLS key to LINE, and MEAS % BK key to LINE	
47	Insert dummy plug in P jack of test set	
48	Unlock and adjust CAL % BK control to obtain reading of 70 on <u>black</u> scale of PERCENT BREAK meter	
	Note: This calibration is special for this test only, and the set must be re-calibrated in the standard way before it is used for other purposes.	
49	Relock CAL % BK control, being careful not to disturb the adjustment	
50	Remove dummy plug from P jack	
51j	If 2B signaling test set is being used - Restore DIAL PLS key to normal	
52k	If 2A signaling test set is being used - Restore DIAL SUPV key to normal	
53	Adjust ADJ PPS control to obtain reading of 10 on 0-20 scale of PULSES PER SECOND meter	
54	Set ADJ % BK switch to M	
55	Adjust ADJ % BK control to obtain reading of 35 on <u>black</u> scale of PERCENT BREAK meter	
	Note: A reading of 35 indicates an actual percent break of 50, since the meter is calibrated for a full scale reading of 70 instead of 100.	
56	Move plug from CAL jack to TS jack of test unit	
	Note: To recheck 70 and 35 readings on PERCENT BREAK meter, return plug to CAL jack and repeat steps 47 to 55, as required.	

STEPACTIONVERIFICATIONAt Office "A"

57 Operate SEND key on test unit

At Office "B"

58 Operate REC key on test unit

If repeater is arranged for 2-way operation -
PERCENT BREAK meter reads within limits given in Table B

If repeater is arranged for one-way operation -
PERCENT BREAK meter reads as shown in Table C

Table B - Percent Break Limits When Pulsing Over One Line Section

Scale Readings on PERCENT BREAK Meter - See Note			
Test Equipment at		When Receiving on Open-Closed Loop Rep or Bal Loop Rep With "X" Option	When Receiving on Bal Loop Rep With "Y" Option
Sending Office	Receiving Office		
SXS Pulse Rep Test Set	SXS Pulse Rep Test Set or Toll Pulse Rep Test Set	55 - 66	34 - 45
	2A or 2B Sig Test Set	23.5 - 31.5*	38.5 - 46.5*
Toll Pulse Rep Test Set or 2A or 2B Sig Test Set	SXS Pulse Rep Test Set or Toll Pulse Rep Test Set	45 - 55	45 - 55
	2A or 2B Sig Test Set	31.5 - 38.5*	31.5 - 38.5*
<u>Note:</u> Because of test set and repeater circuit differences, only the 55 to 66 and the 45 to 55 readings in the table are actual percent break values, but the other readings are equivalent to them. *On black scale.			

Table C - Meter Readings at Office Having Repeater Arranged for One-way Operation

Scale Readings on PERCENT BREAK Meter		
Test Eqpt at Receiving Office	When Receiving on Open-Closed Loop Rep or Bal Loop Rep With "X" Option	When Receiving on Bal Loop Rep With "Y" Option
SXS or Toll Pulse Rep Test Set	0	100
2A or 2B Sig Test Set	70*	0*
*On black scale.		

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STEP	ACTION	VERIFICATION
59m	If repeater is arranged for 2-way operation - Insert plug of one cord of earth potential test circuit in EQ1 jack of repeater, and insert plug of other cord in L jack of repeater <u>Caution: Do not insert plugs simultaneously and do not let their tips or rings touch each other.</u>	PERCENT BREAK meter reads within ± 3 scale divisions of the reading obtained in step 58
60m	Interchange plugs in EQ1 and L jacks <u>Caution: Do not remove or insert plugs simultaneously and do not let their tips or rings touch each other.</u>	PERCENT BREAK meter reads within ± 3 scale divisions of the reading obtained in step 58
61m	Remove plugs from EQ1 and L jacks <u>Caution: Do not remove plugs simultaneously and do not let their tips or rings touch each other.</u>	Same as step 58
<u>With Offices "A" and "B" Interchanged</u>		
62	Check pulses in the opposite direction by repeating steps 57 to 61m	
<u>At Each Office</u>		
63	Remove plug from TS jack of test unit <u>Caution: Make certain that step 63 is completed at both offices before proceeding with step 65n or 66p at either office.</u>	
64	Remove all cords associated with the test sets <u>Caution: To avoid blowing fuses, disconnect power cords from supply jacks before disconnecting from test sets.</u>	Any lighted lamp on a test set is extinguished
65n	If Test C is to be made at this time - Proceed as specified for that test	
66p	If Test C is not to be made at this time - Remove plugs from the LP and TST-S jacks, or from the LP and EQ2 jacks	MAJOR alarm sounds ALM lamp on dial pulse receiving unit lights WD lamp on dial pulse checking unit lights <u>Note: This step causes alarms in other offices (see 3.02).</u>
67p	Operate CA key on dial pulse receiving unit	MAJOR alarm is silenced ALM lamp is extinguished
68p	Operate WD key on dial pulse checking unit	WD lamp is extinguished
69p	Remove remaining connections	GL lamp on test unit is extinguished
70p	Remove blocking tool from relay A on repeater	

<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
<u>B. Two-way Pulsing Test Between Adjacent Offices - Lamp Indications</u>		
<u>At Offices Using 1A Signaling Test Set (Table A, Col B)</u>		
10	Patch 48V jack of test set to TST BAT 48V jack on test and alarm cutoff unit, using P3E cord <u>Caution: To avoid blowing fuses, connect to the test set first.</u>	LINE lamp on test set lights <u>Note: Except for the flashing in step 15, any changes in the condition of this lamp are incidental to the test and may be ignored.</u>
11	Operate DIAL key of test set to DROP, and operate B-G key	
12	Patch LINE and DROP jacks of test set to L and D jacks, respectively, of test unit, using P3E cords	
<u>At Office "A"</u>		
13	Operate SEND key on test unit	
<u>At Office "B"</u>		
14	Operate REC key on test unit	
15	Request employee at office "A" to dial 0 several times	LINE lamp flashes in a uniform manner for each train of pulses <u>Note: If receiving repeater is a balanced loop with "Y" option, the lamp is lighted at the beginning and end of the pulse trains. If the repeater is an open-closed loop or a balanced loop with "X" option, the lamp is dark at the beginning and end of the pulse trains.</u>
<u>At Office "A"</u>		
16	Dial 0 when requested by employee in office "B"	
<u>With Offices "A" and "B" Interchanged</u>		
17	Check the pulses in the opposite direction by repeating steps 13 to 16	
<u>At Each Office</u>		
18	Remove plugs from L and D jacks of test unit <u>Caution: Make certain that step 18 is completed at both offices before proceeding with step 20d or 21e at either office.</u>	
19	Remove all cords associated with the test set <u>Caution: To avoid blowing fuses, disconnect power cord from supply jack before disconnecting from test set.</u>	
20d	If Test C is to be made at this time - Proceed as specified for that test	

<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
21e	If Test C is not to be made at this time - Remove plugs from the LP and TST-S jacks, or from the LP and EQ2 jacks	MAJOR alarm sounds ALM lamp on dial pulse receiving unit lights WD lamp on dial pulse checking unit lights <u>Note:</u> This step causes alarms in other offices (see 3.02).
22e	Operate CA key on dial pulse receiving unit	MAJOR alarm is silenced ALM lamp is extinguished
23e	Operate WD key on dial pulse checking unit	WD lamp is extinguished
24e	Remove remaining connections	GI lamp on test unit is extinguished
25e	Remove blocking tool from relay A on re- peater	

C. Alarm TestAt Offices "A" and "B"

- 10 Remove blocking tool from relay A on
repeater

At Office "A"

- 11 Insert dummy plug in L jack of repeater

At offices "A" and "B" -
MAJOR alarm sounds
ALM lamp on alarm unit lights

Note: If a multiple of the ALM lamp is
provided at a testboard or switchboard,
check that it also lights.

At Each Office

- 12 Operate ACO key on repeater

MAJOR alarm is silenced
G lamp on repeater lights

- 13 Operate CA key on alarm unit

ALM lamp on alarm unit is extinguished

- 14 Check that ground or battery is present
at the following points:

<u>Repeater</u>	<u>Test For</u>	<u>On</u>
Bal loop with "X" option	Grd	Ring of EQ2 jack
Bal loop with "Y" option	Bat.	Tip of EQ2 jack
Open-closed loop arr for 2-way opr	Grd	Sleeve of TST R1 jack

At Office "A"

- 15 Remove dummy plug from L jack of repeater

At offices "A" and "B" -
MAJOR alarm sounds
ALM lamp on alarm unit lights
G lamp on repeater is extinguished

At Each Office

- 16 Restore ACO key to normal

MAJOR alarm is silenced

- 17 Operate CA key on alarm unit

ALM lamp on alarm unit is extinguished

<u>STEP</u>	<u>ACTION</u>	<u>VERIFICATION</u>
<u>At Office "A"</u>		
18	Remove plugs from the LP and TST-S jacks, or the LP and EQ2 jacks	<u>MAJOR alarm sounds</u> <u>ALM lamp on dial pulse receiving unit lights</u> <u>WD lamp on dial pulse checking unit lights</u> At office "B" - MAJOR alarm may sound momentarily ALM lamp on alarm unit may light <u>Note:</u> This step causes alarms in other offices (see 3.02).
<u>At Office "B"</u>		
19	Repeat step 18	<u>MAJOR alarm sounds</u> <u>ALM lamp on dial pulse receiving unit lights</u> <u>WD lamp on dial pulse checking unit lights</u> At office "A" - ALM lamp on alarm unit may light <u>Note:</u> This step causes alarms in other offices (see 3.02).
<u>At Each Office</u>		
20	Operate CA key on dial pulse receiving unit	MAJOR alarm is silenced ALM lamp on dial pulse receiving unit is extinguished
21	Operate WD key on dial pulse checking unit	WD lamp is extinguished
22	Operate CA key on alarm unit (if necessary)	ALM lamp on alarm unit is extinguished
23	Remove remaining connections	G1 lamp on test unit is extinguished

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TELEGRAPH
RETURN TO
DRWG. FILE

5TH FLR. - TWX	
9TH FLR. - TGH	
7TH FLR. - TGH	