INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TD-2 TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type TD-2 relay provides time delay for the * second and third zone contacts of the KD and KD-1 relays.

CONSTRUCTION AND OPERATION

The type TD-2 relay consists of a synchronous motor-driven timer, a saturating transformer and two telephone relays. One of the telephone relays, TX, has a double coil and starts the timer for a fault in zone two or zone three. The other telephone relay, TM, provides seal-in for the T2 contact.

Synchronous Timer

The timer is a small synchronous motor which operates from the current circuit through a saturating transformer, and drives a moving contact arm through a gear train. The contact on the moving arm is a cylindrical silver sleeve, loosely fitted on the moving arm. In making contact, this sleeve rolls across two vertically projecting stationary butt contacts to bridge the gap between them.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out instantly when the motor is de-energized, allowing a spring to reset the moving arm.

Saturating Transformer

The saturating transformer has a double winding current circuit, each winding being fed by a different phase of the protected circuit. Thus, for a fault on any pair of phases, at least one of the current transformer primary windings will be energized. The timing motor will operate when either one or both of the current windings on the saturating transformer are energized.

CHARACTERISTICS

The maximum time delay of the standard TD-2 is two seconds or 120 cycles (60 cycle base). Timers having ranges of 3 or 5 seconds, and 50 cycle timers, are also available.

Minimum pickup of the motor circuit is 2 amperes, 60 cycles, in one current winding. Timing accuracy, however, is not as good at 2 amperes as it is at 3 amperes or greater. Rated voltages are 48, 125, or 250 volts d-c. Continuous current rating is 8 amperes a-c. One second current rating is 196 amperes a-c.

Current Circuit Burden Data

With 5 amperes load current in each primary coil:

Current Transformer	Volt-Amperes	Power Factor
Phase 1	0	------
Phase 2	12.45	116° lag
Phase 3	13.25	52° lag

Telephone Relay Resistance Data

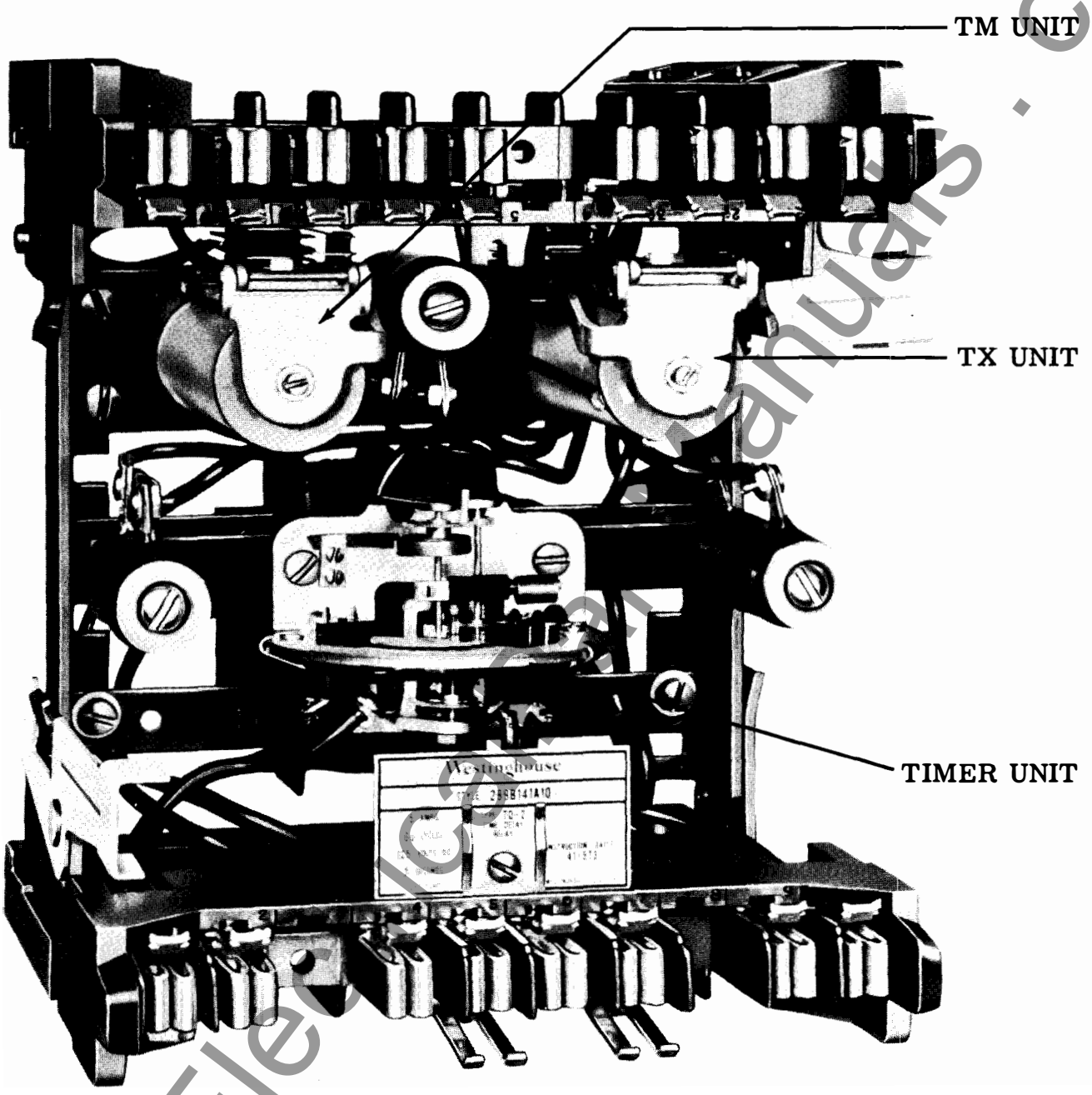
TX: 500 ohms in each coil.
TM: 500 ohms.

SETTINGS

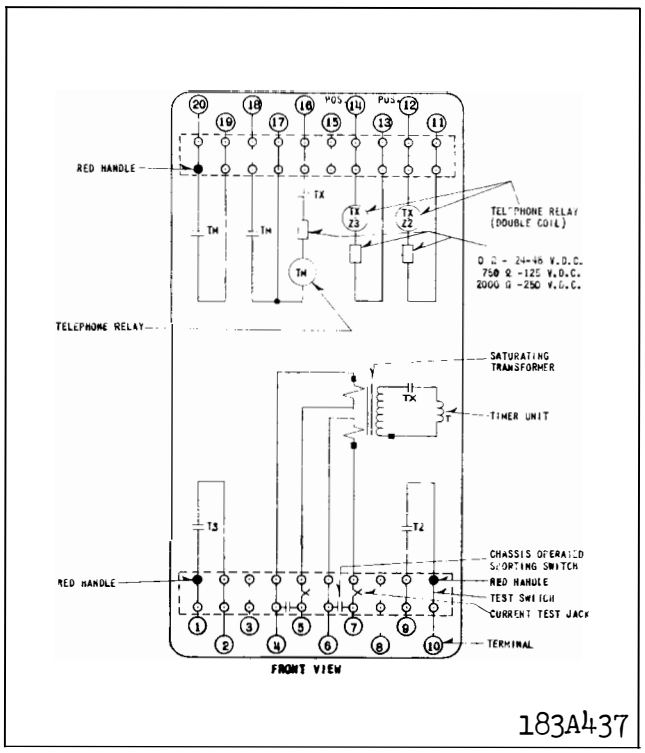
The time delay of the timer is set to coordinate with the relays which are backed up by the second and third zone impedance elements. Two sets of stationary contacts, mounted in Micarta insulating blocks, are adjustable around a semi-circular calibrated scale. The relay setting is obtained by lining up the white slot in the center of the block with the number of cycles time delay desired.

INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes



* *Fig. 1. Type TD-2 Relay without Case.*



* *Fig. 2. Internal Schematic of the Type TD-2 Relay in the FT22 Case.*

on the flange for semiflush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments, other than those covered under "SETTINGS", should be required.

Acceptance Test

The following check is recommended to insure that the relay is in proper working order:

A. Telephone Relays

Check that TX closes when 80% rated d-c voltage is applied to terminals 11 and 12 or 13 and 14. With TX contacts closed, check that TM closes its contacts when 80% rated d-c voltage is applied to terminals 16 and 17.

B. Timer

With TX contacts closed, and terminal 5 connected to terminal 7, check that the contact arm rotates when 1.5 amperes a-c is applied to terminals 4 and 6.

Timing accuracy should be approximately ± 3 cycles for a low setting of the stationary contacts and approximately ± 4 cycles for a high setting of the stationary contacts.

Routine Maintenance

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

* It is recommended that a timing check be made, with 3.0 amperes a-c through terminals 4 and 5 or 6 and 7. This check should be made with the stationary contact in the in-service position. Accuracy should be approximately ± 3 cycles for a low setting of the stationary contact and ± 4 cycles for a high setting of the stationary contact.

Calibration

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order.

A. Timer Zero Position

With the stationary contact set for 30 cycles, close TX and energize transformer primary terminals 4 and 5 or 6 and 7 with 2.5 amperes a-c. Check the average of 10 readings. If not very close to 30 cycles, loosen the holding screw and rotate the moving arm on the shaft. Check readings again. NOTE: It is important to main-

tain the vertical position of the arm on the shaft when the holding screw is loosened. This must be done so that the moving contact will properly bridge both sets of stationary contacts. In other words, the moving arm must make a positive contact and still reset freely from any position, particularly after it has just passed over the stationary contact.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

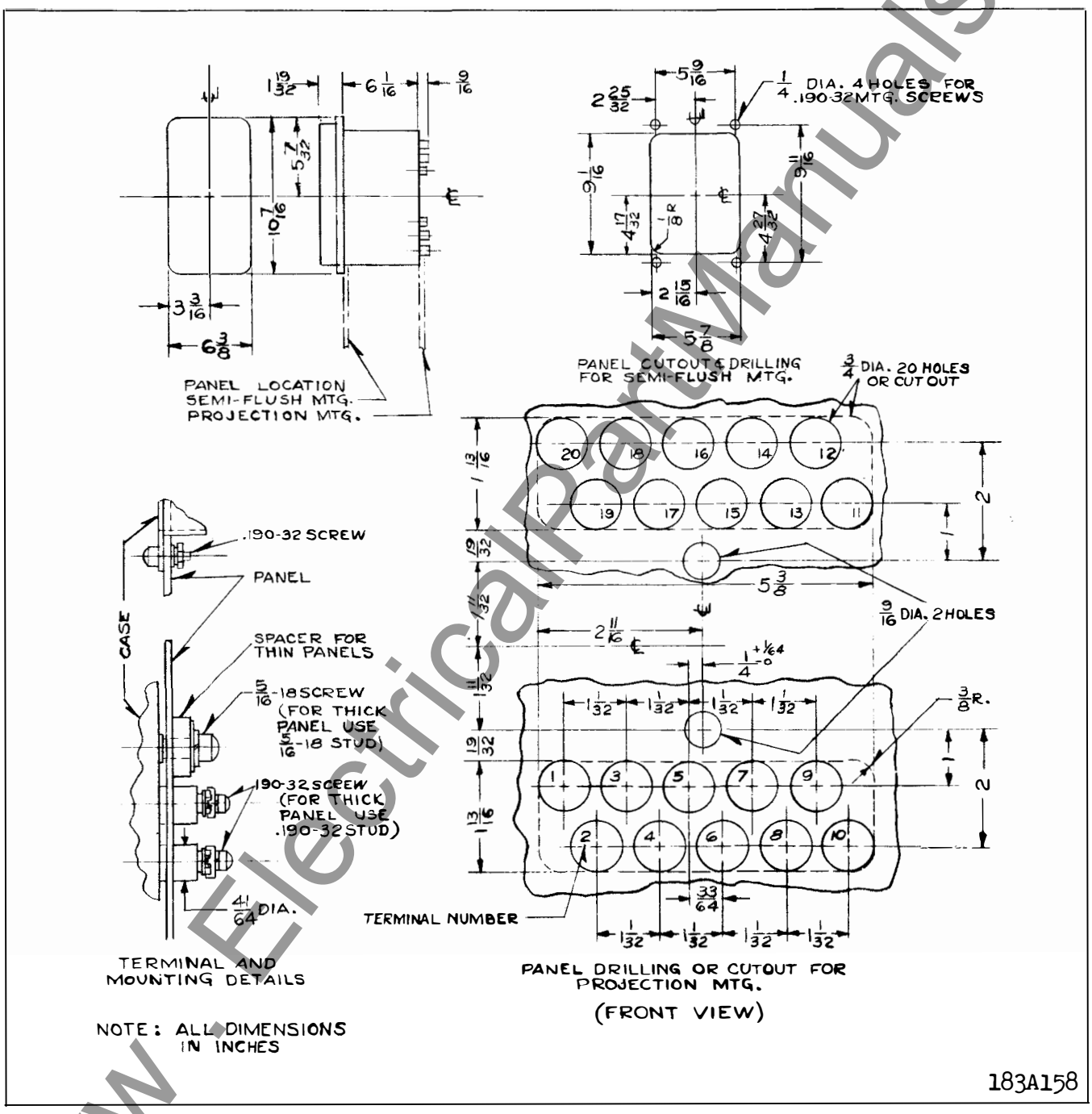


Fig. 3. Outline and Drilling Plan of the Type TD-2 Relay in the FT22 Case.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TD-2 TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type TD-2 relay provides time delay for the *second and third zone contacts of the KD, KD-1, KD-4 and KD-41 relays.

CONSTRUCTION AND OPERATION

The type TD-2 relay consists of a synchronous motor-driven timer, a saturating transformer and two telephone relays. One of the telephone relays, TX, has a double coil and starts the timer for a fault in zone two or zone three. The other telephone relay, TM, provides seal-in for the T2 contact.

Synchronous Timer

The timer is a small synchronous motor which operates from the current circuit through a saturating transformer, and drives a moving contact arm through a gear train. The contact on the moving arm is a cylindrical silver sleeve, loosely fitted on the moving arm. In making contact, this sleeve rolls across two vertically projecting stationary butt contacts to bridge the gap between them.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out instantly when the motor is de-energized, allowing a spring to reset the moving arm.

Saturating Transformer

The saturating transformer has a double winding current circuit, each winding being fed by a different phase of the protected circuit. Thus, for a fault on any pair of phases, at least one of the current transformer primary windings will be energized. The timing motor will operate when either one or both of the current windings on the saturating transformer are energized.

CHARACTERISTICS

The maximum time delay of the standard TD-2 is two seconds or 120 cycles (60 cycle base). Timers having ranges of 3 or 5 seconds, and 50 cycle timers, are also available.

Minimum time setting is 10 cycles for 2 second relay, 12 cycles for 3 second relay and 20 cycles for 5 second relay.

Minimum pickup of the motor circuit is 2 amperes, 60 cycles, in one current winding. Timing accuracy, however, is not as good at 2 amperes as it is at 3 amperes or greater. Rated voltages are 48, 125, or 250 volts d-c. Continuous current rating is 8 amperes a-c. One second current rating is 196 amperes a-c.

Current Circuit Burden Data

With 5 amperes load current in each primary coil:

Current Transformer	Volt-Amperes	Power Factor
Phase 1	0	------
Phase 2	12.45	116° lag
Phase 3	13.25	52° lag

Telephone Relay Resistance Data

TX: 500 ohms in each coil.
TM: 500 ohms.

SETTINGS

The time delay of the timer is set to coordinate with the relays which are backed up by the second and third zone impedance elements. Two sets of stationary contacts, mounted in Micarta insulating blocks, are adjustable around a semi-circular calibrated scale. The relay setting is obtained by lining up the white slot in the center of the block with the number of cycles time delay desired.

INSTALLATION

The relays should be mounted on switchboard

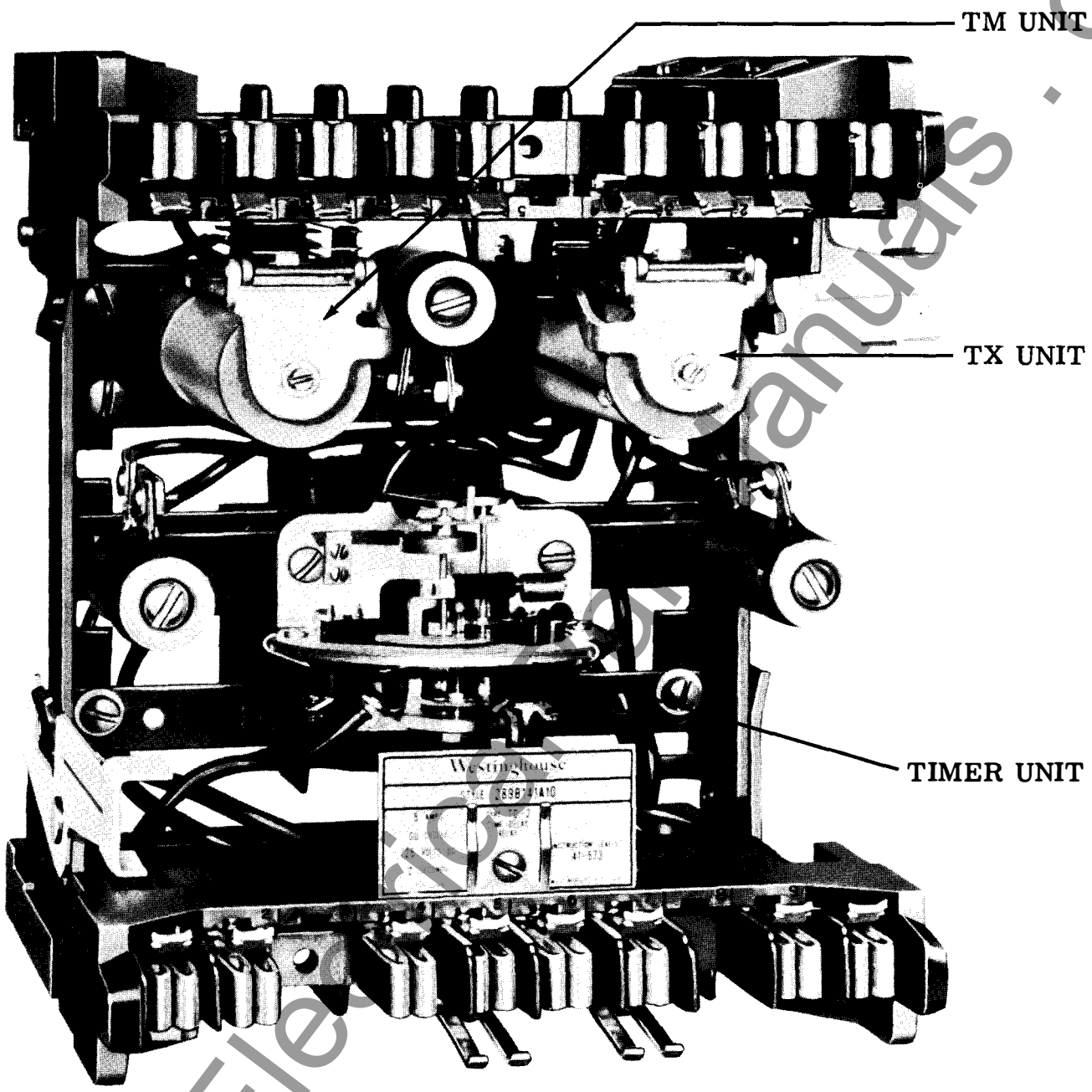


Fig. 1. Type TD-2 Relay without Case.

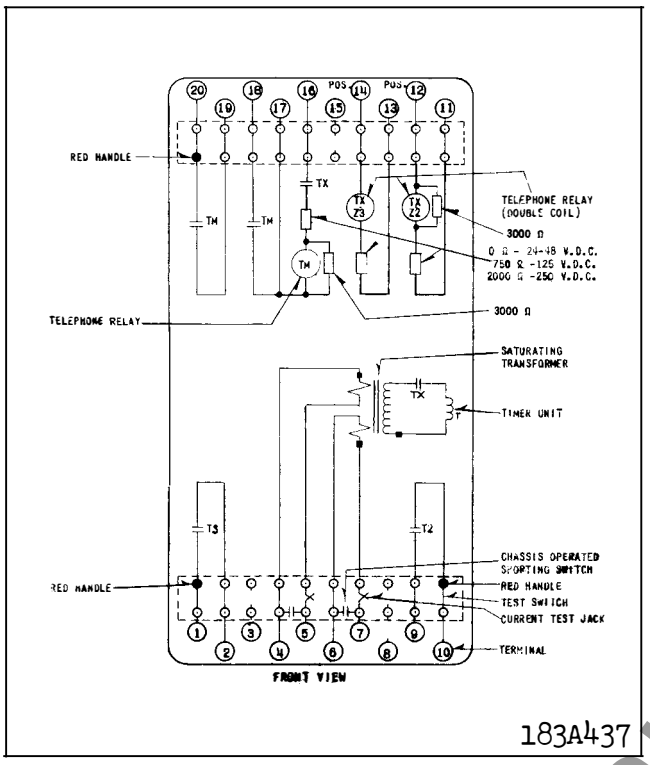


Fig. 2. Internal Schematic of the Type TD-2 Relay in the FT22 Case.

panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes on the flange for semiflush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments, other than those covered under "SETTINGS", should be required.

Acceptance Test

The following check is recommended to insure that the relay is in proper working order:

A. Telephone Relays

Check that TX closes when 80% rated d-c voltage is applied to terminals 11 and 12 or 13 and 14. With TX contacts closed, check that TM closes its contacts when 80% rated d-c voltage is applied to terminals 16 and 17.

B. Timer

With TX contacts closed, and terminal 5 connected to terminal 7, check that the contact arm rotates when 1.5 amperes a-c is applied to terminals 4 and 6.

Timing accuracy should be approximately ± 3 cycles for a low setting of the stationary contacts and approximately ± 4 cycles for a high setting of the stationary contacts.

Routine Maintenance

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

It is recommended that a timing check be made, with 3.0 amperes a-c through terminals 4 and 5 or 6 and 7. This check should be made with the stationary contact in the in-service position. Accuracy should be approximately ± 3 cycles for a low setting of the stationary contact and ± 4 cycles for a high setting of the stationary contact.

Calibration

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order.

A. Timer Zero Position

With the stationary contact set for 30 cycles, close TX and energize transformer primary terminals 4 and 5 or 6 and 7 with 2.5 amperes a-c. Check the average of 10 readings. If not very close to 30 cycles, loosen the holding screw and rotate the moving arm on the shaft. Check readings again. NOTE: It is important to main-

tain the vertical position of the arm on the shaft when the holding screw is loosened. This must be done so that the moving contact will properly bridge both sets of stationary contacts. In other words, the moving arm must make a positive contact and still reset freely from any position, particularly after it has just passed over the stationary contact.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

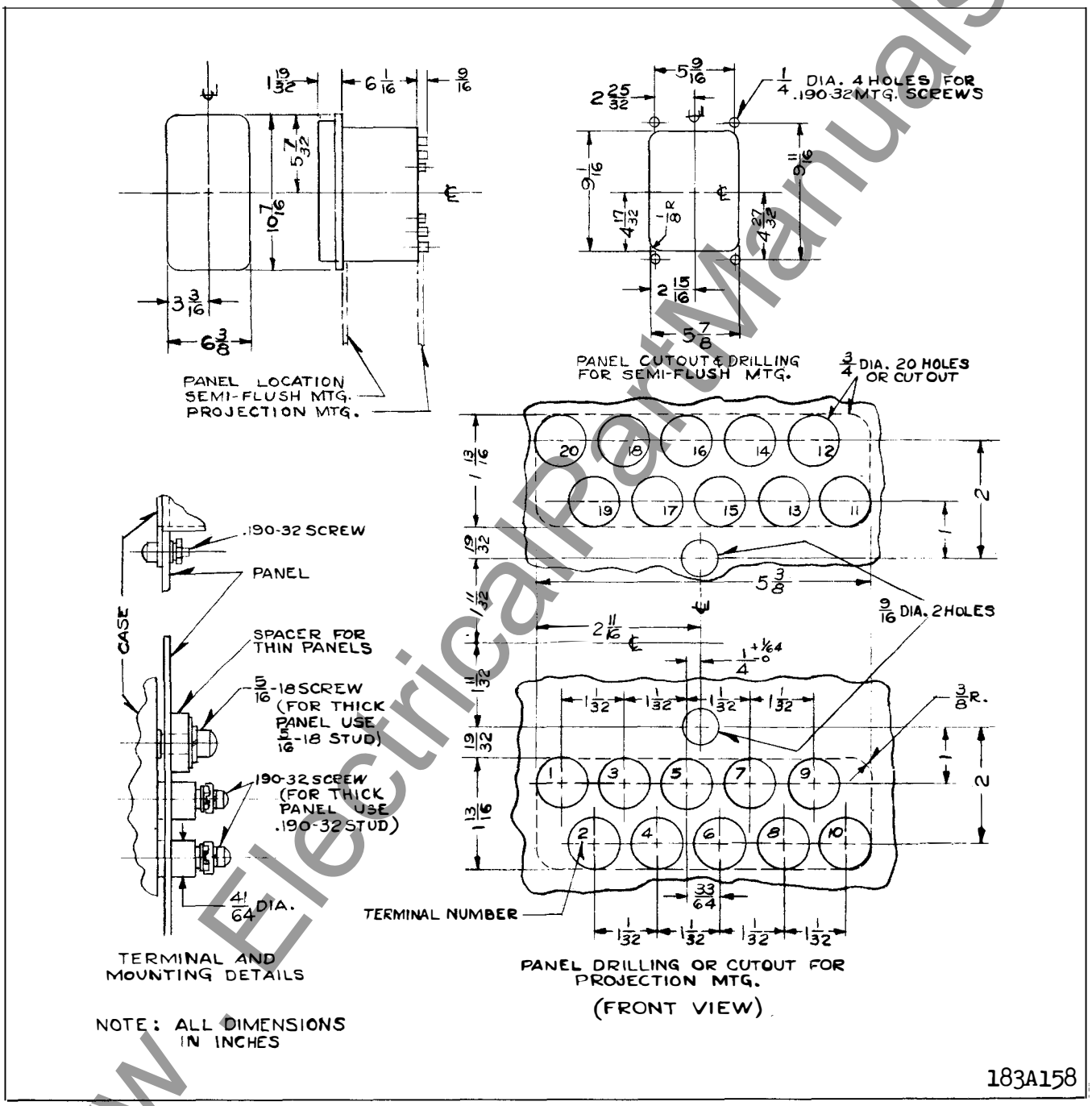


Fig. 3. Outline and Drilling Plan of the Type TD-2 Relay in the FT22 Case.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY DEPARTMENT **NEWARK, N. J.**
Printed in U. S. A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TD-2 TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type TD-2 relay provides time delay for the * second and third zone contacts of the KD and KD-1 relays.

CONSTRUCTION AND OPERATION

The type TD-2 relay consists of a synchronous motor-driven timer, a saturating transformer and two telephone relays. One of the telephone relays, TX, has a double coil and starts the timer for a fault in zone two or zone three. The other telephone relay, TM, provides seal-in for the T2 contact.

Synchronous Timer

The timer is a small synchronous motor which operates from the current circuit through a saturating transformer, and drives a moving contact arm through a gear train. The contact on the moving arm is a cylindrical silver sleeve, loosely fitted on the moving arm. In making contact, this sleeve rolls across two vertically projecting stationary butt contacts to bridge the gap between them.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out instantly when the motor is de-energized, allowing a spring to reset the moving arm.

Saturating Transformer

The saturating transformer has a double winding current circuit, each winding being fed by a different phase of the protected circuit. Thus, for a fault on any pair of phases, at least one of the current transformer primary windings will be energized. The timing motor will operate when either one or both of the current windings on the saturating transformer are energized.

CHARACTERISTICS

The maximum time delay of the standard TD-2 is two seconds or 120 cycles (60 cycle base). Timers having ranges of 3 or 5 seconds, and 50 cycle timers, are also available.

Minimum time setting is 10 cycles for 2 second relay, 12 cycles for 3 second relay and 20 cycles for 5 second relay.

Minimum pickup of the motor circuit is 2 amperes, 60 cycles, in one current winding. Timing accuracy, however, is not as good at 2 amperes as it is at 3 amperes or greater. Rated voltages are 48, 125, or 250 volts d-c. Continuous current rating is 8 amperes a-c. One second current rating is 196 amperes a-c.

Current Circuit Burden Data

With 5 amperes load current in each primary coil:

Current Transformer	Volt-Amperes	Power Factor
Phase 1	0	------
Phase 2	12.45	116° lag
Phase 3	13.25	52° lag

Telephone Relay Resistance Data

TX: 500 ohms in each coil.
TM: 500 ohms.

SETTINGS

The time delay of the timer is set to coordinate with the relays which are backed up by the second and third zone impedance elements. Two sets of stationary contacts, mounted in Micarta insulating blocks, are adjustable around a semi-circular calibrated scale. The relay setting is obtained by lining up the white slot in the center of the block with the number of cycles time delay desired.

INSTALLATION

The relays should be mounted on switchboard

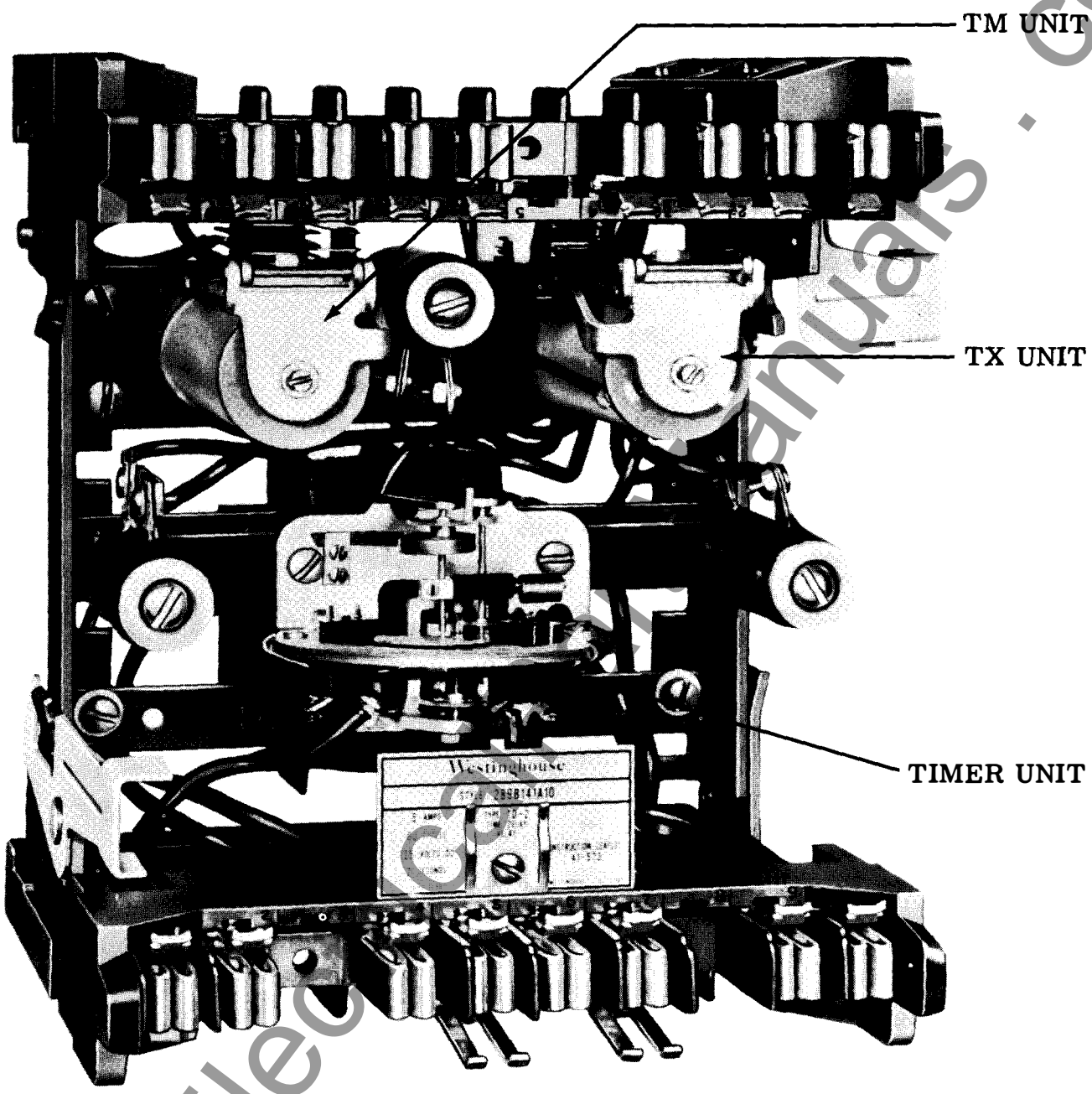


Fig. 1. Type TD-2 Relay without Case.

tain the vertical position of the arm on the shaft when the holding screw is loosened. This must be done so that the moving contact will properly bridge both sets of stationary contacts. In other words, the moving arm must make a positive contact and still reset freely from any position, particularly after it has just passed over the stationary contact.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

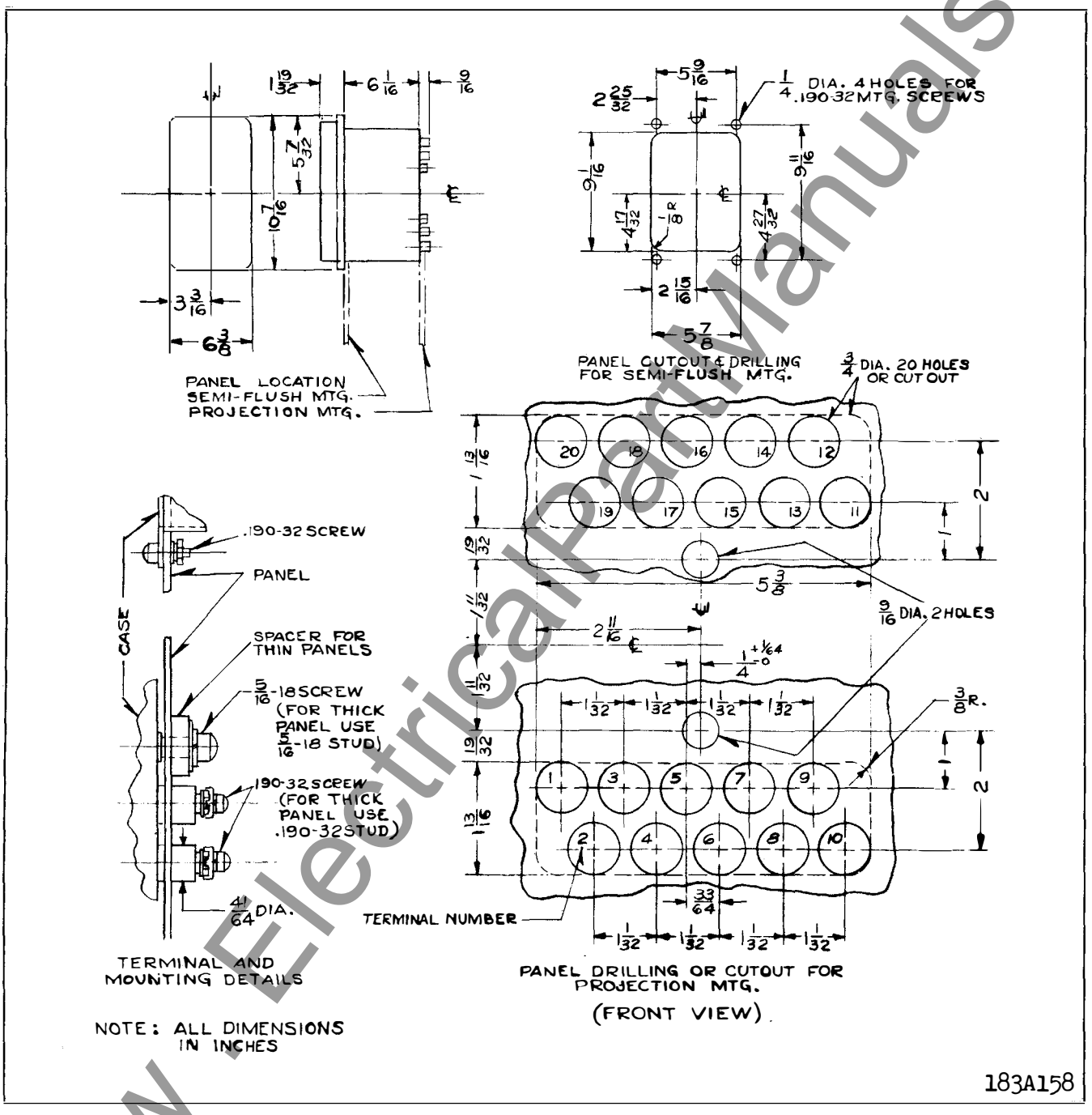
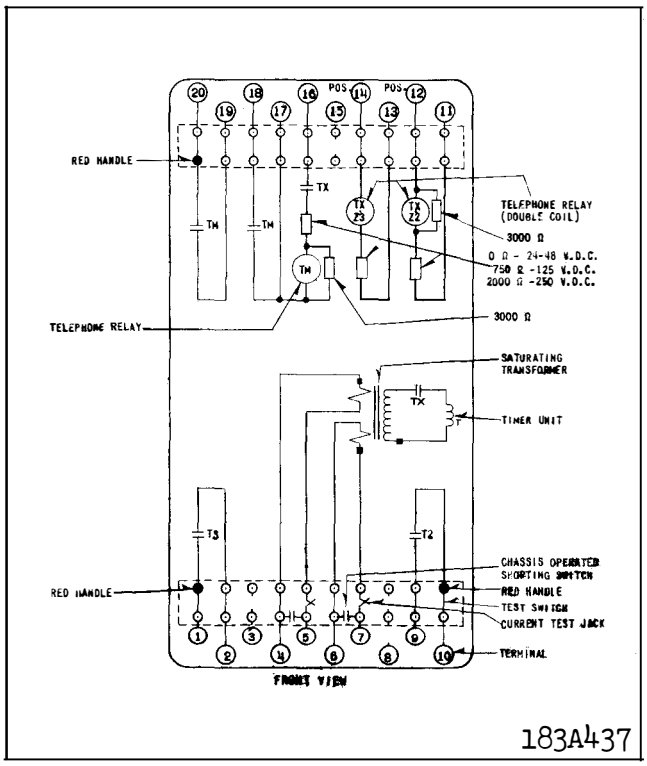


Fig. 3. Outline and Drilling Plan of the Type TD-2 Relay in the FT22 Case.



* *Fig. 2. Internal Schematic of the Type TD-2 Relay in the FT22 Case.*

panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes on the flange for semiflush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments, other than those covered under "SETTINGS", should be required.

Acceptance Test

The following check is recommended to insure that the relay is in proper working order:

A. Telephone Relays

Check that TX closes when 80% rated d-c voltage is applied to terminals 11 and 12 or 13 and 14. With TX contacts closed, check that TM closes its contacts when 80% rated d-c voltage is applied to terminals 16 and 17.

B. Timer

With TX contacts closed, and terminal 5 connected to terminal 7, check that the contact arm rotates when 1.5 amperes a-c is applied to terminals 4 and 6.

Timing accuracy should be approximately ± 3 cycles for a low setting of the stationary contacts and approximately ± 4 cycles for a high setting of the stationary contacts.

Routine Maintenance

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

It is recommended that a timing check be made, with 3.0 amperes a-c through terminals 4 and 5 or 6 and 7. This check should be made with the stationary contact in the in-service position. Accuracy should be approximately ± 3 cycles for a low setting of the stationary contact and ± 4 cycles for a high setting of the stationary contact.

Calibration

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order.

A. Timer Zero Position

With the stationary contact set for 30 cycles, close TX and energize transformer primary terminals 4 and 5 or 6 and 7 with 2.5 amperes a-c. Check the average of 10 readings. If not very close to 30 cycles, loosen the holding screw and rotate the moving arm on the shaft. Check readings again. NOTE: It is important to main-

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TD-2 TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type TD-2 relay provides time delay for the * second and third zone contacts of the KD and KD-1 relays.

CONSTRUCTION AND OPERATION

The type TD-2 relay consists of a synchronous motor-driven timer, a saturating transformer and two telephone relays. One of the telephone relays, TX, has a double coil and starts the timer for a fault in zone two or zone three. The other telephone relay, TM, provides seal-in for the T2 contact.

Synchronous Timer

The timer is a small synchronous motor which operates from the current circuit through a saturating transformer, and drives a moving contact arm through a gear train. The contact on the moving arm is a cylindrical silver sleeve, loosely fitted on the moving arm. In making contact, this sleeve rolls across two vertically projecting stationary butt contacts to bridge the gap between them.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out instantly when the motor is de-energized, allowing a spring to reset the moving arm.

Saturating Transformer

The saturating transformer has a double winding current circuit, each winding being fed by a different phase of the protected circuit. Thus, for a fault on any pair of phases, at least one of the current transformer primary windings will be energized. The timing motor will operate when either one or both of the current windings on the saturating transformer are energized.

CHARACTERISTICS

The maximum time delay of the standard TD-2 is two seconds or 120 cycles (60 cycle base). Timers having ranges of 3 or 5 seconds, and 50 cycle timers, are also available.

Minimum pickup of the motor circuit is 2 amperes, 60 cycles, in one current winding. Timing accuracy, however, is not as good at 2 amperes as it is at 3 amperes or greater. Rated voltages are 48, 125, or 250 volts d-c. Continuous current rating is 8 amperes a-c. One second current rating is 196 amperes a-c.

Current Circuit Burden Data

With 5 amperes load current in each primary coil:

Current Transformer	Volt-Amperes	Power Factor
Phase 1	0	------
Phase 2	12.45	116° lag
Phase 3	13.25	52° lag

Telephone Relay Resistance Data

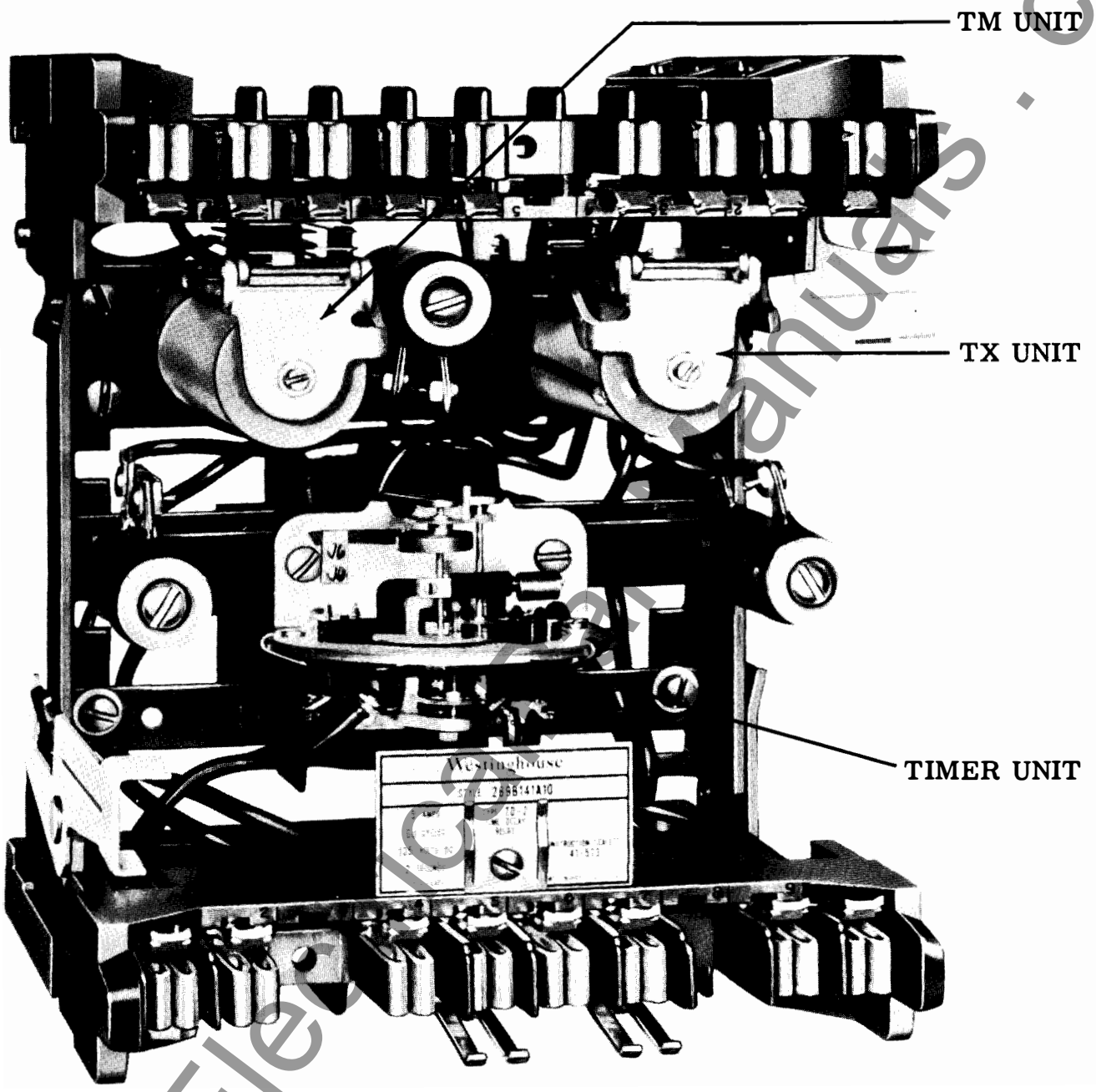
TX: 500 ohms in each coil.
TM: 500 ohms.

SETTINGS

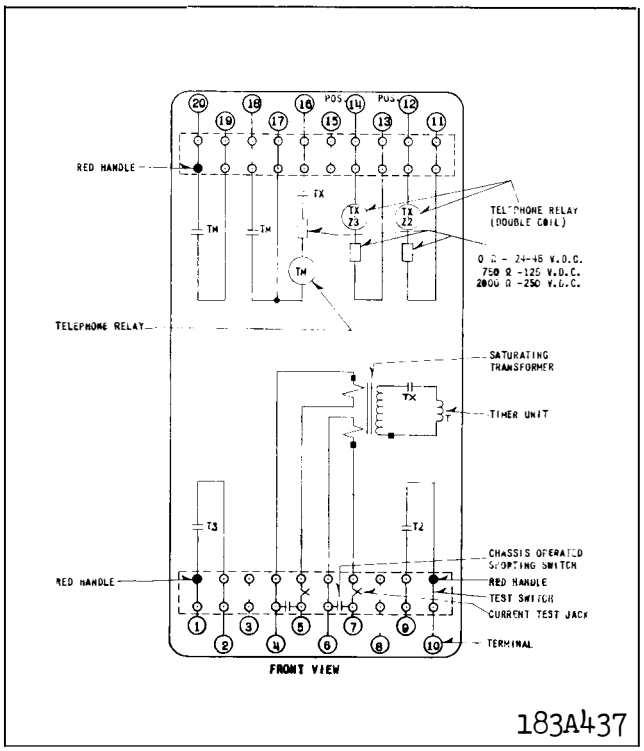
The time delay of the timer is set to coordinate with the relays which are backed up by the second and third zone impedance elements. Two sets of stationary contacts, mounted in Micarta insulating blocks, are adjustable around a semi-circular calibrated scale. The relay setting is obtained by lining up the white slot in the center of the block with the number of cycles time delay desired.

INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes



✱ *Fig. 1. Type TD-2 Relay without Case.*



* *Fig. 2. Internal Schematic of the Type TD-2 Relay in the FT22 Case.*

on the flange for semiflush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments, other than those covered under "SETTINGS", should be required.

Acceptance Test

The following check is recommended to insure that the relay is in proper working order:

A. Telephone Relays

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B. Timer

With TX contacts closed, and terminal 5 connected to terminal 7, check that the contact arm rotates when 1.5 amperes a-c is applied to terminals 4 and 6.

Timing accuracy should be approximately ± 3 cycles for a low setting of the stationary contacts and approximately ± 4 cycles for a high setting of the stationary contacts.

Routine Maintenance

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

* It is recommended that a timing check be made, with 3.0 amperes a-c through terminals 4 and 5 or 6 and 7. This check should be made with the stationary contact in the in-service position. Accuracy should be approximately ± 3 cycles for a low setting of the stationary contact and ± 4 cycles for a high setting of the stationary contact.

Calibration

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order.

A. Timer Zero Position

With the stationary contact set for 30 cycles, close TX and energize transformer primary terminals 4 and 5 or 6 and 7 with 2.5 amperes a-c. Check the average of 10 readings. If not very close to 30 cycles, loosen the holding screw and rotate the moving arm on the shaft. Check readings again. NOTE: It is important to main-

tain the vertical position of the arm on the shaft when the holding screw is loosened. This must be done so that the moving contact will properly bridge both sets of stationary contacts. In other words, the moving arm must make a positive contact and still reset freely from any position, particularly after it has just passed over the stationary contact.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

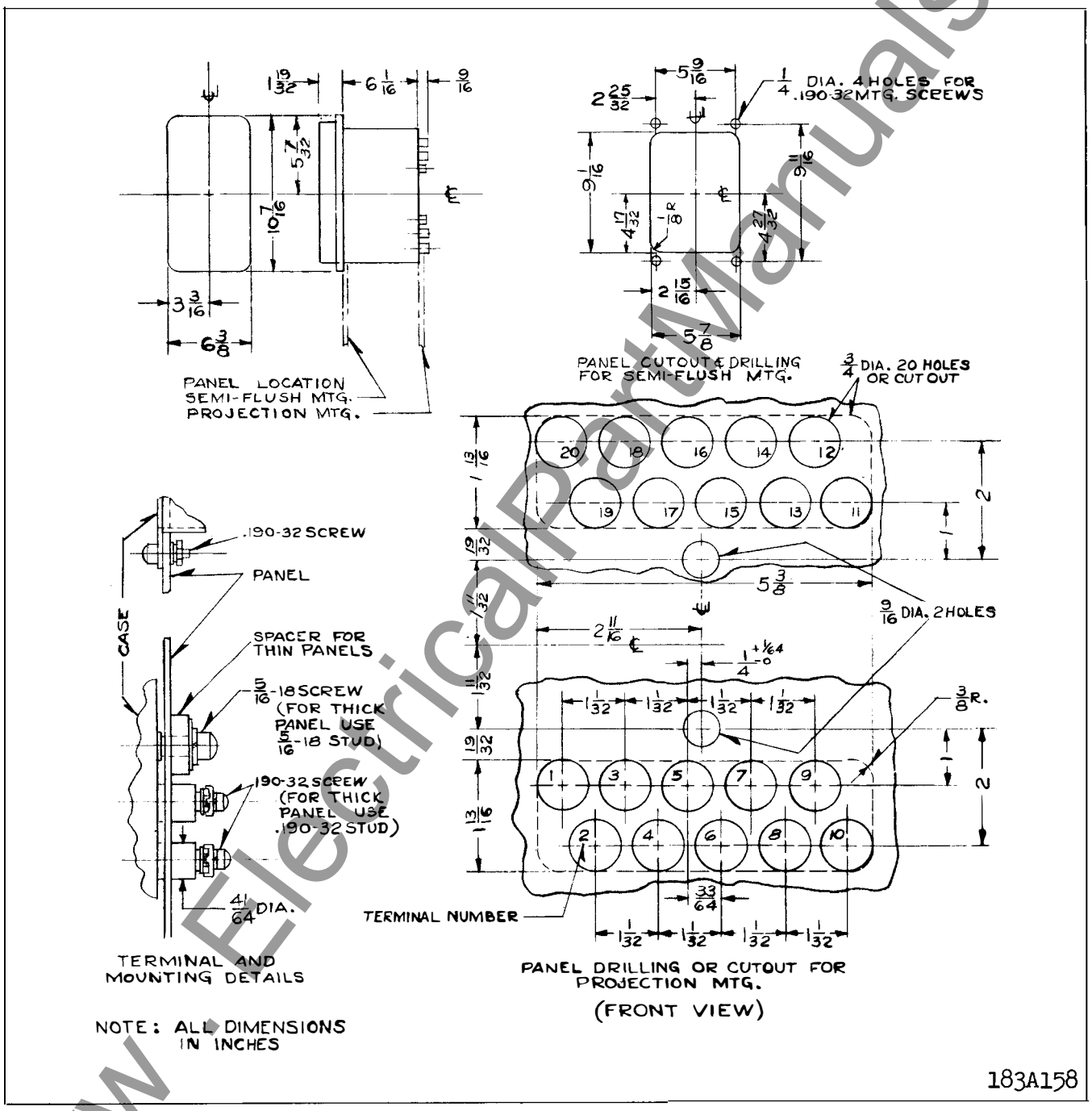

Fig. 3. Outline and Drilling Plan of the Type TD-2 Relay in the FT22 Case.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TD-2 TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type TD-2 relay provides time delay for the second and third zone contacts of the KD and KD-1 relays.

CONSTRUCTION AND OPERATION

The type TD-2 relay consists of a synchronous motor-driven timer, a saturating transformer and two telephone relays. One of the telephone relays, TX, has a double coil and starts the timer for a fault in zone two or zone three. The other telephone relay, TM, provides seal-in for the T2 contact.

Synchronous Timer

The timer is a small synchronous motor which operates from the current circuit through a saturating transformer, and drives a moving contact arm through a gear train. The contact on the moving arm is a cylindrical silver sleeve, loosely fitted on the moving arm. In making contact, this sleeve rolls across two vertically projecting stationary butt contacts to bridge the gap between them.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out instantly when the motor is de-energized, allowing a spring to reset the moving arm.

Saturating Transformer

The saturating transformer has a double winding current circuit, each winding being fed by a different phase of the protected circuit. Thus, for a fault on any pair of phases, at least one of the current transformer primary windings will be energized. The timing motor will operate when either one or both of the current windings on the saturating transformer are energized.

CHARACTERISTICS

The maximum time delay of the standard TD-2 is two seconds or 120 cycles (60 cycle base). Timers having ranges of 3 or 5 seconds, and 50 cycle timers, are also available.

Minimum pickup of the motor circuit is 2 amperes, 60 cycles in one current winding. Rated voltages are 48, 125, or 250 volts d-c. Rated current is 5 amperes a-c.

Current Circuit Burden Data

With 5 amperes load current in each primary coil:

Current Transformer	Volt-Amperes	Power Factor
Phase 1	0	------
Phase 2	12.45	116° lag
Phase 3	13.25	52° lag

Telephone Relay Resistance Data

TX: 500 ohms in each coil.
TM: 500 ohms.

SETTINGS

The time delay of the timer is set to coordinate with the relays which are backed up by the second and third zone impedance elements. Two sets of stationary contacts, mounted in Micarta insulating blocks, are adjustable around a semi-circular calibrated scale. The relay setting is obtained by lining up the white slot in the center of the block with the number of cycles time delay desired.

INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes

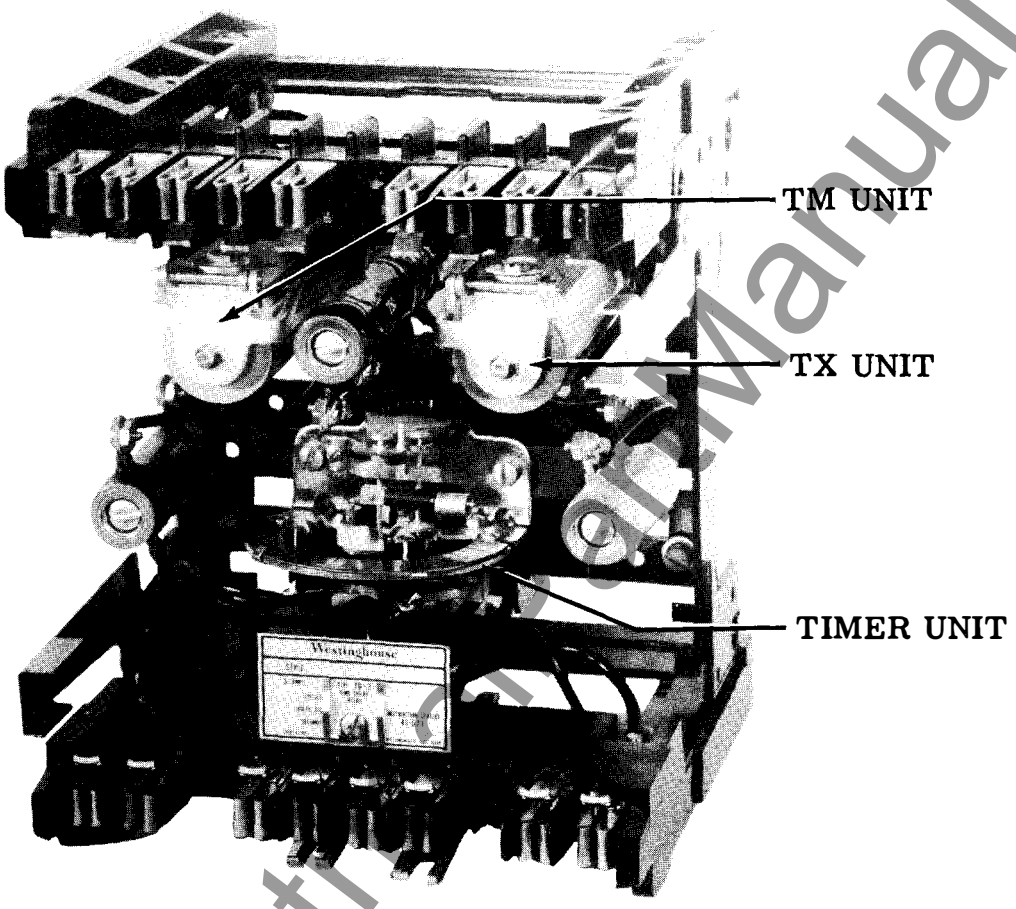

Fig. 1. Type TD-2 Relay without Case.

tain the vertical position of the arm on the shaft when the holding screw is loosened. This must be done so that the moving contact will properly bridge both sets of stationary contacts. In other words, the moving arm must make a positive contact and still reset freely from any position, particularly after it has just passed over the stationary contact.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

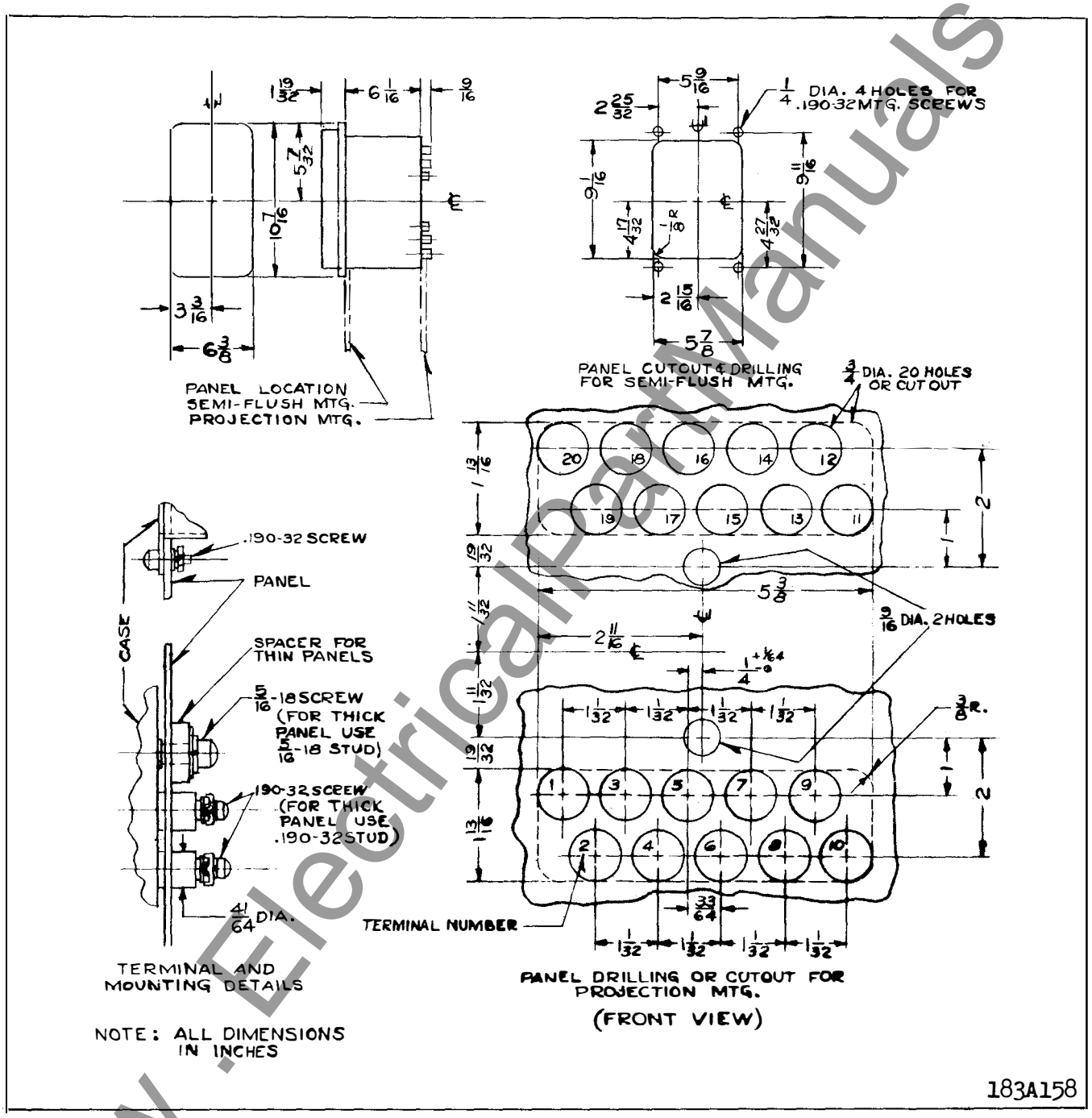

Fig. 3. Outline and Drilling Plan of the Type TD-2 Relay in the FT22 Case.

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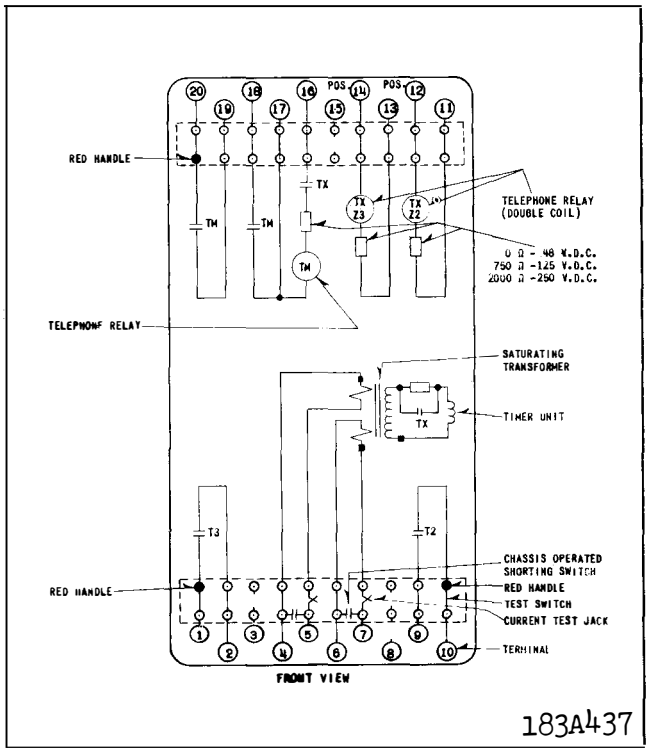

Fig. 2. Internal Schematic of the Type TD-2 Relay in the FT22 Case.

on the flange for semiflush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay, no customer adjustments, other than those covered under "SETTINGS", should be required.

Acceptance Test

The following check is recommended to insure that the relay is in proper working order:

A. Telephone Relays

Check that TX closes when 80% rated d-c voltage is applied to terminals 11 and 12 or 13 and 14. With TX contacts closed, check that TM closes its contacts when 80% rated d-c voltage is applied to terminals 16 and 17.

B. Timer

With TX contacts closed, and terminal 5 connected to terminal 7, check that the contact arm rotates when 1.5 amperes a-c is applied to terminals 4 and 6.

Timing accuracy should be approximately ± 3 cycles for a low setting of the stationary contacts and approximately ± 4 cycles for a high setting of the stationary contacts.

ROUTINE MAINTENANCE

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

It is recommended that a timing check be made, with 2.5 amperes a-c through terminals 4 and 5 or 6 and 7. This check should be made with the stationary contact in the in-service position. Accuracy should be approximately ± 3 cycles for a low setting of the stationary contact and ± 4 cycles for a high setting of the stationary contact.

Calibration

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order.

TIMER ZERO POSITION

With the stationary contact set for 30 cycles, close TX and energize transformer primary terminals 4 and 5 or 6 and 7 with 2.5 amperes a-c. Check the average of 10 readings. If not very close to 30 cycles, loosen the holding screw and rotate the moving arm on the shaft. Check readings again. NOTE: It is important to main-