IBM Field Engineering

Theory - Maintenance

29 Card Punch Features

29 Interpreting Card Punch, Model C

S223-2926-2

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Preface

This theory-maintenance manual provides information on all the special features of all models of the IBM 29 Card Punch, and on the IBM 29 Interpreting Card Punch, Model C.

Information in this manual is limited to areas distinctive to the Model C and special features, and presupposes a knowledge of the following IBM 29 Card Punch manuals:

Field Engineering Theory of Operation, Form 225-3358.

Field Engineering Maintenance Manual, Form 225-3357.

This manual includes information and wiring diagrams for the IBM 29 Interpreting Card Punch, Model C wire-contact relay machine and for wire-contact relay machines with the following features:

Variable-length feed feature.
Interspersed gangpunch feature.
Auxiliary duplication feature.
High-speed skip feature.
Card insertion feature.
Self-checking number feature, Modulus 10.
Self-checking number feature, Modulus 11.
Self-checking number generator feature.

Refer to the individual wiring diagram to determine the correct timing adjustments for a particular machine. Only wiring diagrams for the IBM 29 Model C and for the special features are included in this manual. Wiring diagrams for Models A and B are contained in Field Engineering Theory of Operation, *IBM 29 Card Punch*, Form 225-3358.

Third Edition (July 1969)
This edition, 223-2926-2, is a reprint of 223-2926-1 incorporating changes released in the following FE Supplement:

Form Number	*Date*
S23-4046	October 30, 1967

This edition does not obsolete previous editions. Specifications herein are continually subject to change. Any changes will be reported in subsequent revisions or FE Supplements.

This manual has been prepared by the IBM Systems Development Division, Product Publications, Dept. B96, PO Box 390, Poughkeepsie, N. Y. 12602. A form is provided at the back of this publication for the reader's comments. If the form has been removed, comments may be sent to the above address.

Contents

Safety Procedures

Safety cannot be overemphasized. To insure personal safety and the safety of co-workers, each customer engineer should make it an everyday practice to observe safety precautions at all times. All customer engineers should be familiar with the general safety practices and procedures for performing artificial respiration that are outlined in IBM Form 229-1264.

Always use a reliable voltmeter to verify that power is actually off after using power off switches. Although all power supplies are provided with bleeder resistors to drain off capacitor charges when power is dropped, it is wise to check all capacitors with a meter before attempting maintenance. A defective bleeder resistor could create an unexpected hazard.

Chapter 1. Variable-Length Feed Feature

Theory of Operation

- **The Variable-Length Feed allows the processing of 51-, 60-, 66-, and 80-column cards.**
- **The operator controls the conversion of the machine from one card length to another.**
- **Only one length of card may be processed at one time.**

Figure 1-1 shows the Variable-Length Feed feature on an IBM 29 Card Punch. With this feature, the operator can set the machine to process any one of four different card lengths. This conversion is made by changing settings of the feed hopper guide, card pusher, stacker stop, and the timing of program-cam contact 1 (PCC1).

An IBM with the Variable-Length Feed feature has the following modifications:

1. Additions to the feed hopper and card-feed mechanism.
2. New registration assembly.
3. Additions to the card transport.
4. Additions to the program assembly.
5. Additions to the stacker assembly.
6. Additions to the electrical system.

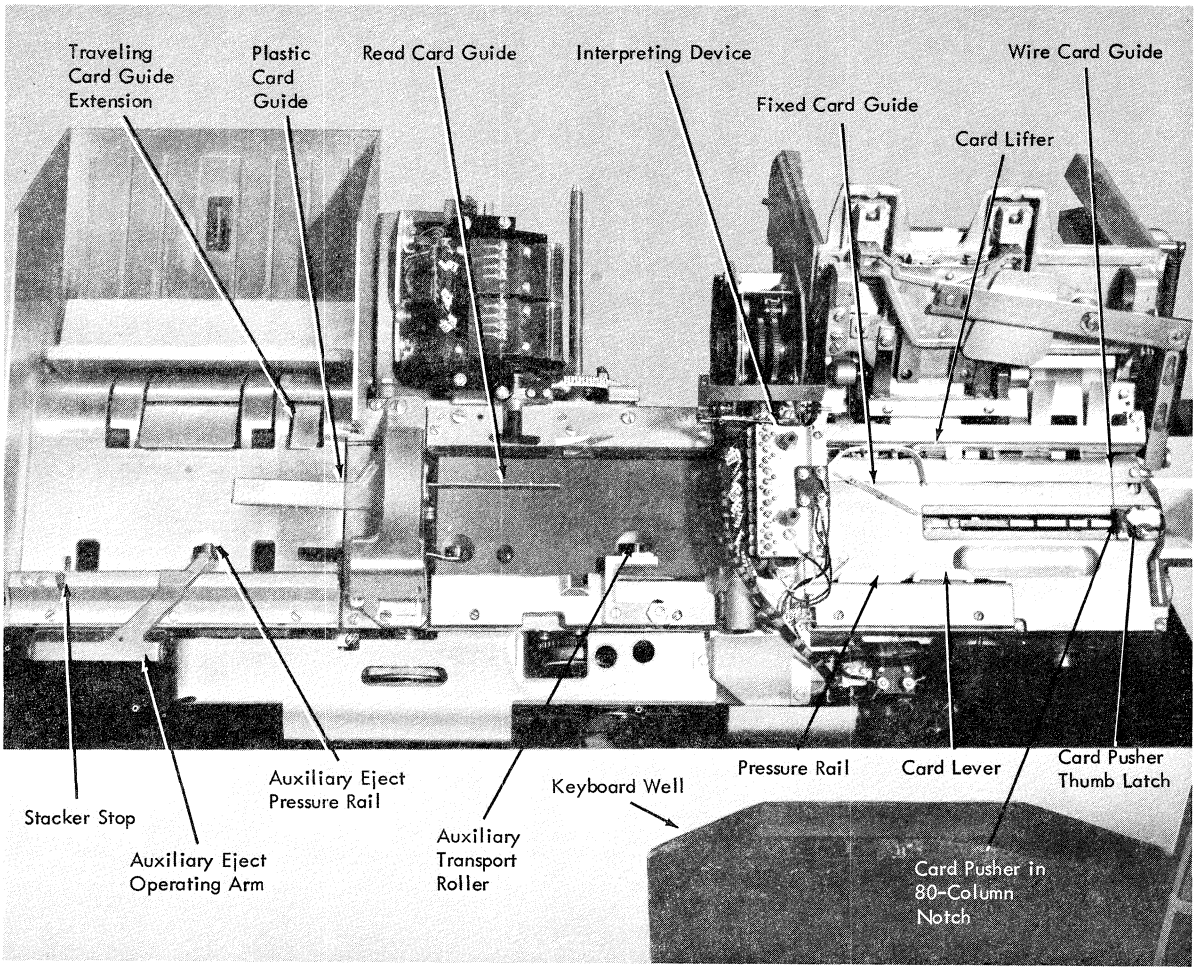


Figure 1-1. Variable-Length Feed Feature (on the IBM 29 Model C)

Introduction

- **Program-card preparation is the same for cards of all lengths.**
- **Field definition must *not* be punched beyond the last column of the particular short cards that are being processed.**
- **Operator instructions on converting from one card length to another are inside the program-drum cover.**

Program Control

Program cards must be punched, starting at column 1 only, with the number of columns in the cards to be processed. However, if the machine is equipped with a high-speed skip feature, high-speed skip can be programmed beyond the number of columns in the cards being processed to obtain the maximum benefits of this feature. Otherwise, program-card preparation is the same as for 80-column cards.

Knobs in the column-indicator control program-cam extensions for skipping from card to card (Figure 1-2). Use care, in installing the program drum, to guide the locating pin into the hole in the column indicator without damage to the knobs. It may be necessary to move the clamping-strip handle slightly to aid the installation.

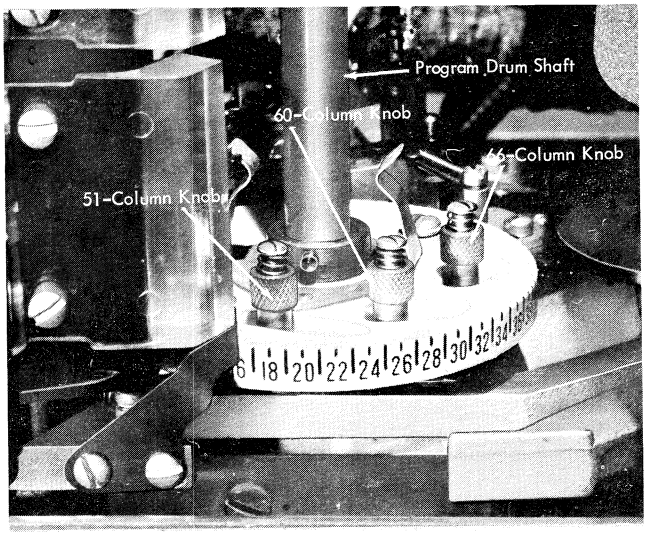


Figure 1-2. Program-Cam Extension Knobs (80-Column Setting)

Machine Settings

The operator can easily make all settings to change card lengths but only one length of card may be processed at one time. For each length of card there is a card guide, which is raised on the hopper bed to form a right-hand guide. The operator performs these preliminary steps to process each length of card:

1. Select the proper card guide in the hopper and lift it forward into position. For any selected card length, all card guides for cards of shorter length must rest in the hopper bed. Note that the 80-column card guide is fixed at the right side of the hopper. The sliding pressure plate in the hopper is notched to pass over the raised card guides.

2. Lift the thumb latch and move the card pusher to the proper card-column notch. A spring guides each card under the card pusher for correct feeding position.

3. Align 51- and 60-column cards to the stacker drum by pulling the stacker stop operating lever toward the front of the machine. For 66- or 80-column cards, push the lever back.

4. The following settings are necessary whether or not a program drum is used. To set program-cam extension knobs, lift the program-drum cover forward and turn the program-control lever to raise the program-drum starwheels. Space to column 16 on the column indicator and turn off the main switch. Remove the program drum.

Caution: These program-cam extension knobs are interlocked and will bind if moved in any sequence but the one given here. To adjust the knobs, lift them out of their countersunk recesses and move in this sequence:

a. To change to a longer card, move each knob in ascending numeric sequence to the countersunk recess at the left end of each slot. For example, to change from 51-column cards to 80-column cards, first move the 51-column knob, then the 60-column knob, and then the 66-column knob.

b. To change to a shorter card, move each knob in descending numeric sequence to the countersunk recess at the right end of each slot. For example, to change from 80-column cards to 51-column cards, first move the 66-column knob to the right, then the 60-column knob, and then the 51-column knob.

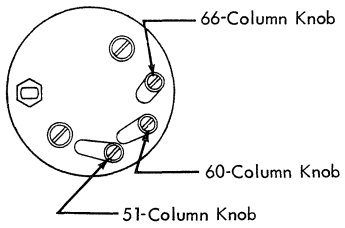
These steps are summarized on a decal inside the program drum cover (Figure 1-3).

Backspace

Backspacing may not be used in or through the 16th column from the end of the card. Backspacing in this area would interfere with a card in the pre-registered position.

Manual Insertion of a Card

Manual card insertion for detail-station registration is possible for all four card lengths. For correct registration, move the card to the right against the registration pusher.



HOPPER
For 51-, 60-, 66-column cards, lift left, center, or right card guide in hopper bed, respectively.
PUNCHING STATIONS BED
Lift card pusher and position securely in desired notch. Left to right, the notches correspond to 51-, 60-, 66-, and 80-column cards respectively.
STACKER BED
For 51- and 60-column cards, move card stop in stacker bed to raised position.
PROGRAM DRUM
To set program assembly for length of card:
1. Turn program control lever off.
2. Space to column 16.
3. Turn main line power switch off.
4. Remove program drum.
5. Position knobs on column indicator by lifting and moving full length of slots:
   80-column cards - All knobs to left.
   66-column cards - Knob 66 only to right.
   60-column cards - Knobs 60 and 66 only to right.
   51-column cards - All knobs to right.

Always move knobs in sequence (66-column knob, 60-column knob, 51-column knob) for shorter card setting. For longer cards, move knobs in reverse sequence.

Figure 1-3. Instructions Inside Program Drum Cover

Functional Units

- **Three movable guides are added to the hopper.**
- **The card pusher has four different positions to accommodate the different card sizes.**
- **The detail card lever is located at the detail right pressure rail.**
- **Two auxiliary transport rolls are added.**
- **The eject station has a movable stop to be used for 51- or 60-column cards only.**
- **Three program-cam extensions control automatic skipping from the last column of a short card to column 1 of the program drum.**

Feed Hopper

Regardless of length, all cards are aligned to the left side of the hopper. Alignment is maintained by one of three hopper guides that is in an elevated position. Normally, preselect a guide by lifting the rear edge. The guides correspond to 51-, 60-, and 66-column card feeding (Figure 1-4).

To handle both short and long cards, the feed knives and feed rolls are located more to the left, and positioned closer together than on standard hoppers. Three aligner fingers and two curved guides are added to the right end of the card guide.

Card Registration

The registration assembly and detail station are changed considerably. A sliding registration device replaces the arc-motion pusher arm. The mechanism consists of a notched bar mounted in guides and driven by the pusher arm. The card pusher is carried on the bar and latched in one of the notches. The position of the pusher can be changed by the operator for the correct card length. The notches are used for 51-, 60-, 66-, and 80-column cards (Figure 1-4).

Beneath the bar is the gripper plunger rod. When the pusher registers a card, the plunger is moved a short distance, causing the pusher to grip the card. Registration and the amount of gripping action are adjustable. They are not changed by the removal of the detail-station bed plate (Figure 1-5).

A wire card guide, mounted to the card pusher, replaces the pusher-hood plate and guides the card under the pusher gripper.

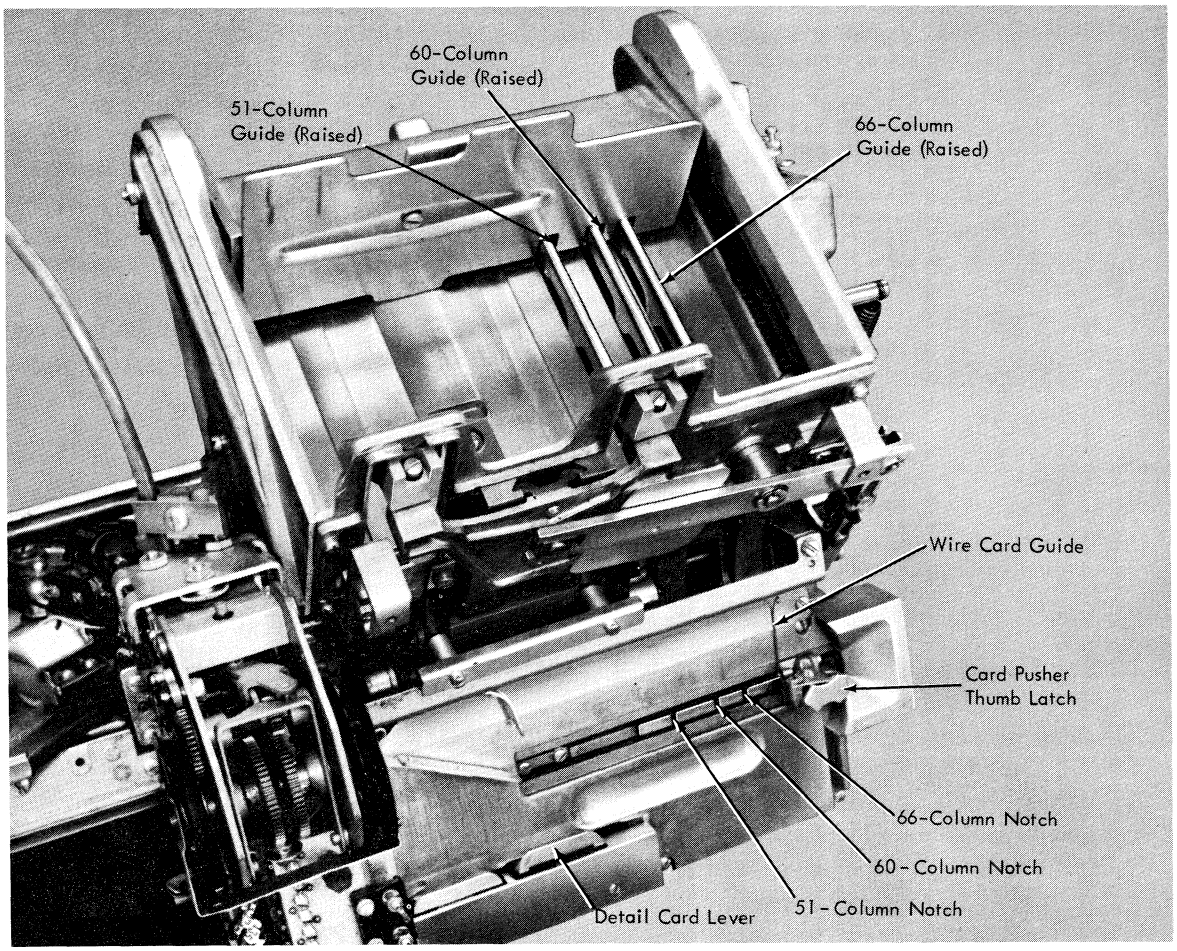


Figure 1-4. Hopper and Detail Station

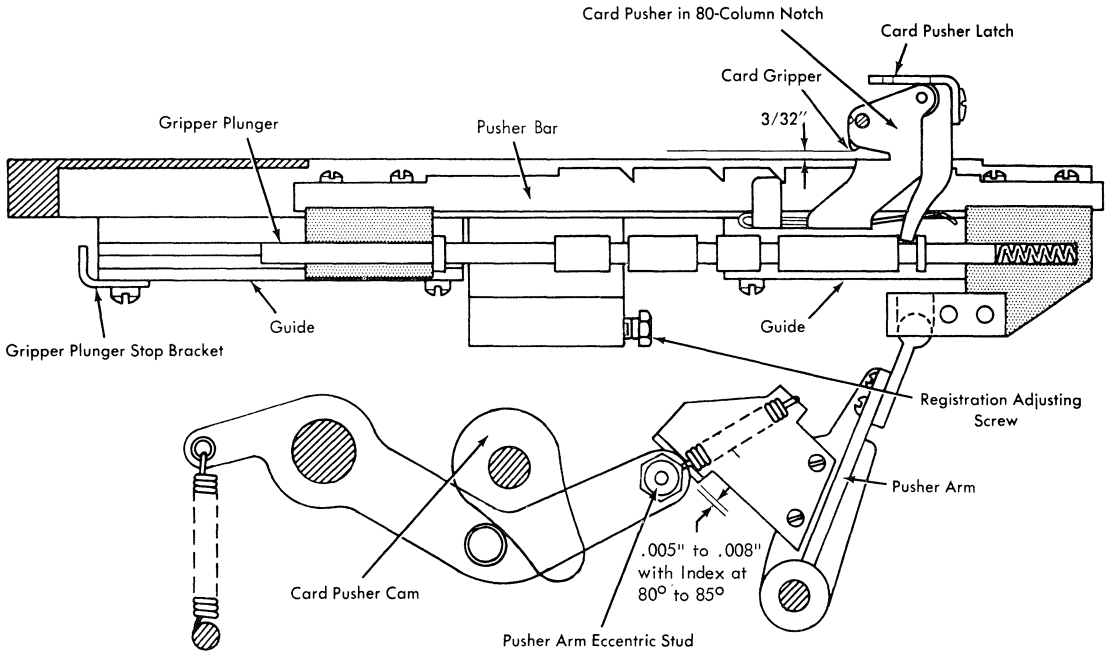


Figure 1-5. Card-Pusher Registration Assembly

Auxiliary Card Transport

An auxiliary-card-transport assembly moves short cards from the punch station to the master station (Figure 1-6). The mechanism, located below the bed plate of the master station, consists of a feed roll geared to the program-drum shaft. Normally, the feed roll clears the bottom surface of a card. Under control of a magnet, the feed roll can be brought up against a card, pressing it against an idler roll for transport. The magnet is energized only during card-to-card skip.

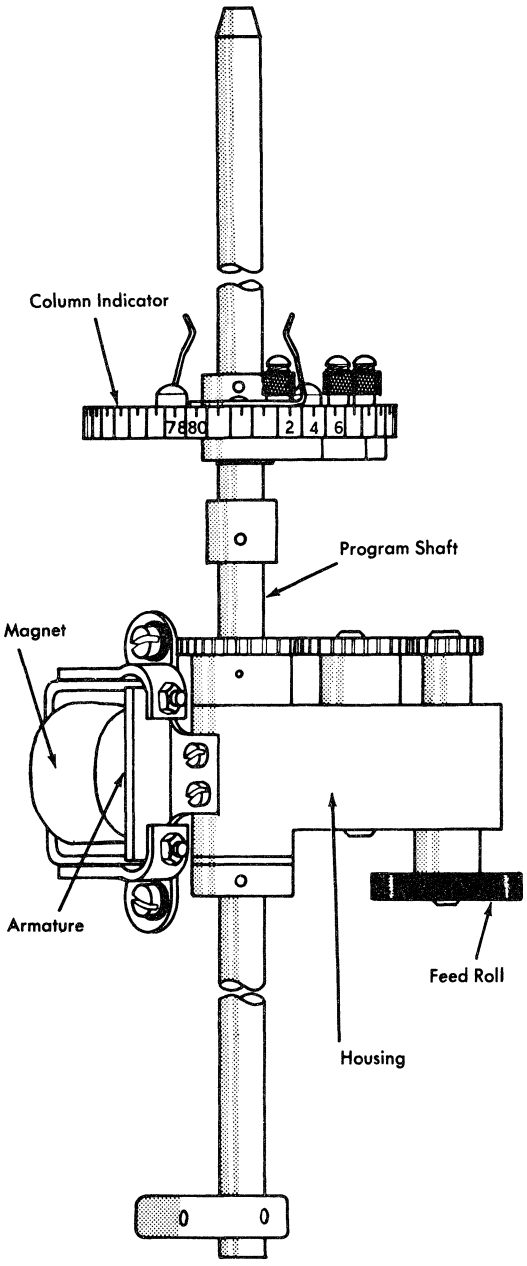


Figure 1-6. Auxiliary Card Transport

Card Stacking

To handle short cards, the stacker and eject mechanism is supplemented with an auxiliary eject roll, a stacker stop, and an extension on the traveling card guide (Figures 1-7 and 1-1).

The auxiliary roll is located in the bed plate of the eject station and is continuously running. During eject operations, a pressure roll pivots against the card to bring it against the auxiliary roll. A cam on the left end of the stacker-drum shaft drives the pressure arm and roll mechanism.

The stacker stop in the left side of the bed plate pivots up to stop 51- and 60-column cards only. The operator can select and raise it to its operating position by pressing down on the front edge of the L-shaped stop. The stacker operation is delayed 25 degrees to provide the necessary time to carry a short card against the stacker stop.

An arm extends to the right from the traveling card guide to guide a short card as it is ejected from the master station.

Program-Cam Extensions

Three program-cam extensions (Figure 1-8) control automatic skipping from the last column of a short card to column 1 of the program drum. The extensions are next to the 81-column cam and are detented into place by knurled knobs. There is an overlap to the extensions so that a low-value knob cannot be detented away from center until the higher-value knobs are detented. The extensions, their overlap, and the 81st-column cam provide one continuous camming surface for program-cam contact 1.

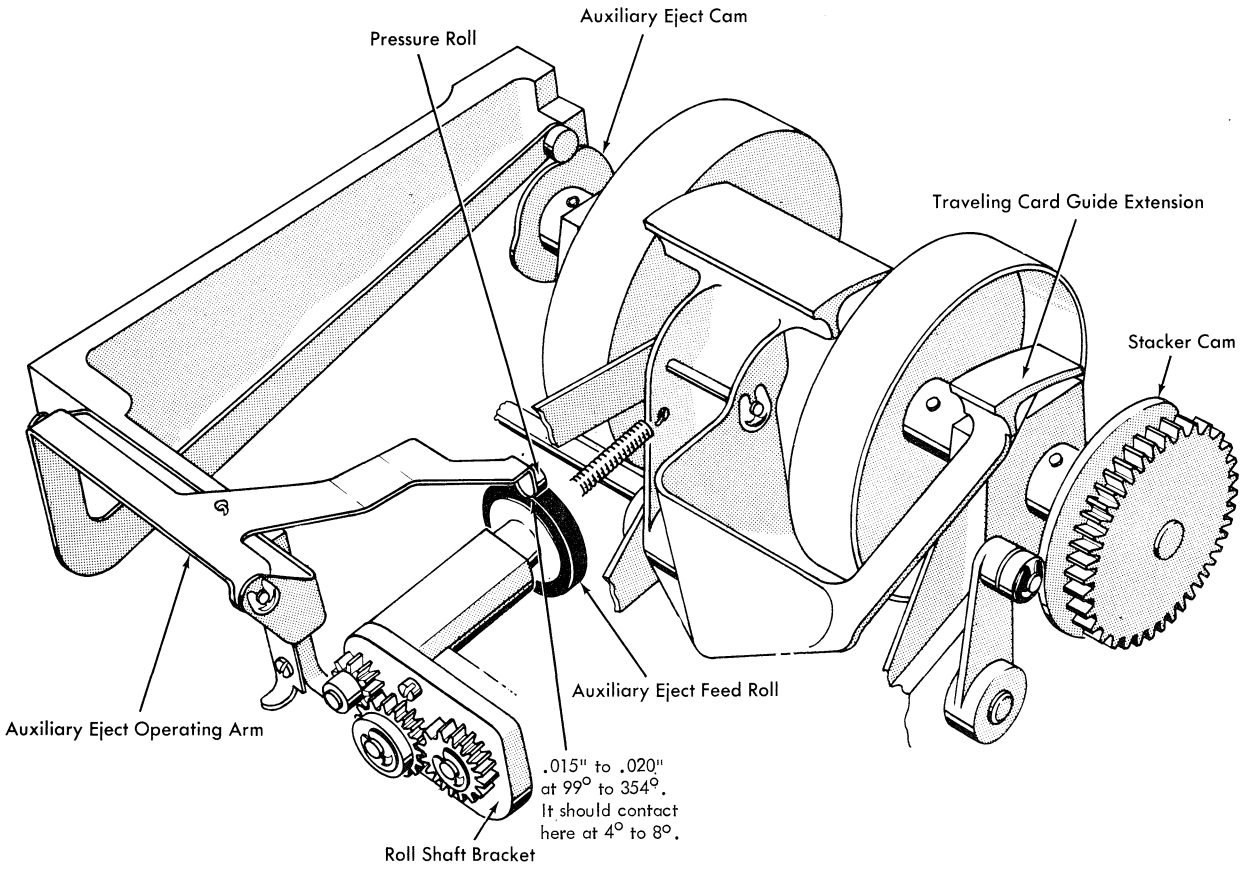


Figure 1-7. Auxiliary Eject Mechanism

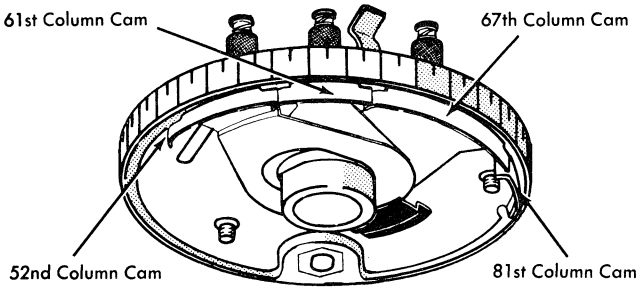


Figure 1-8. Program-Cam Extensions on Column Index (51-Column Setting)

Principles of Operation

- **An auxiliary-transport magnet is added for the variable-length feed.**
- **PCC1 timing can be set at different positions.**

Description

The auxiliary transport magnet brings a roller against short cards so that they will reach the read station. The magnet is de-energized when program-cam contact 1 (PCC1) opens at column 88.

PCC1 makes at different columns, depending upon the length of the card being used, as follows:

CARD LENGTH	MAKE TIME
51	51-1/3
60	60-1/3
66	66-1/3
80	80-1/3

PCC1 breaks in column 88-1/3 for all cards.

Circuit Objectives (Reed Relay)

Figure 1-9 is a schematic and is not intended as a point-to-point wiring diagram.

To transfer PCC1 when the end of a short card is reached and skip the card to the read station via the auxiliary-transport mechanism:

1. Pick skip relays. PCC1.
2. Energize escape magnet. PCC1.
3. Pick variable-length feed (VLCD) relay. CF3.
4. Hold VLCD relay. PCC2.
5. Energize AUX TRAN MAG. VLCD 125-1. PCC1.
6. Drop AUX TRAN MAG. PCC1 breaks 88-1/3.

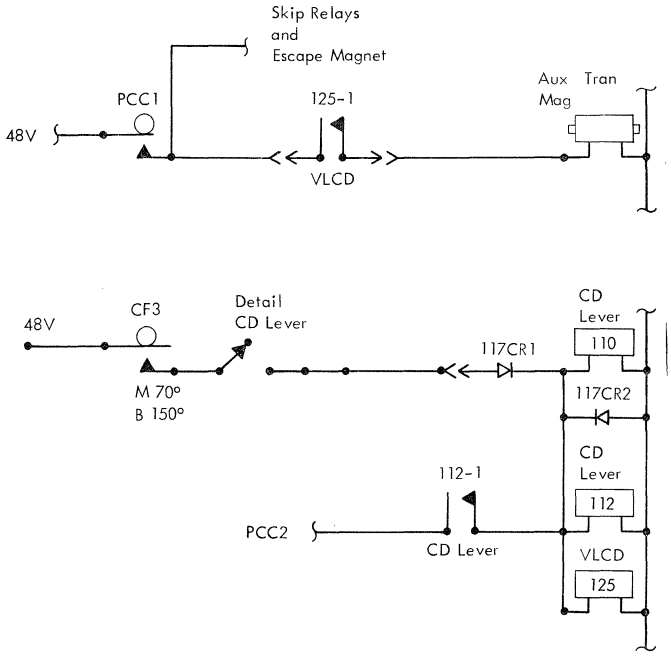


Figure 1-9. Variable-Length Feed Schematic (Reed Relay)

Circuit Objectives (Wire-Contact Relay)

Figure 1-10 is a schematic and is not intended as a point-to-point wiring diagram.

To transfer PCC1 when the end of a short card is reached and to skip the card to the read station via the auxiliary-transport mechanism:

1. Pick skip relay. PCC1.
2. Energize escape magnet. PCC1.
3. Pick variable-length feed (VLCD) relay. CF4
4. Hold VLCD relay. PCC2.
5. Energize AUX TRANS MAG. VLCD 48-4.PCC1.
6. Drop AUX TRANS MAG. PCC1 breaks 88-1/3.

Maintenance

The variable-length card device processes 51-, 60-, 66-, and 80-column cards. The following modifications are made to the standard machine:

1. Three movable guides are added to the hopper.
2. The card pusher has four different positions to accommodate the different-length cards.
3. The stacker has a movable stop to be used for 51- or 60-column cards only.
4. Program cam 1 has three movable extensions for short cards.
5. Two auxiliary transport rolls are added.

Adjustments

This section describes procedures peculiar to the variable-length feed; items common to all feeds are shown in Field Engineering Maintenance Manual, *IBM 29 Card Punch*, Form 225-3357.

Pusher Card Guide

Form the spring next to its mounting screw for the following conditions:

1. Spring guide should be at right angle to the pusher.
2. Mounting end of guide should clear punch bed plate by $\frac{1}{32}$"; other end should clear by $\frac{1}{16}$".

Card-Registration Assembly

1. Adjust guides so that the pusher bar moves freely without excessive play (Figure 1-5).
2. Mount the registration assembly on the machine with the pusher arm engaged in its socket and the bed plate to the left, against a machined stop.
3. Pusher bar must have free motion throughout its entire travel.
4. Form the card gripper so that it is $\frac{3}{32}$" above the pusher block and, when moved against the block, it makes contact squarely.
5. With pusher-arm eccentric stud backed away, position the registration-adjusting screw for correct registration by using a card of any length.
6. Set card-feed index at 80° to 85° and adjust the pusher-arm eccentric stud for 0.005" to 0.008" clearance to the pusher arm.

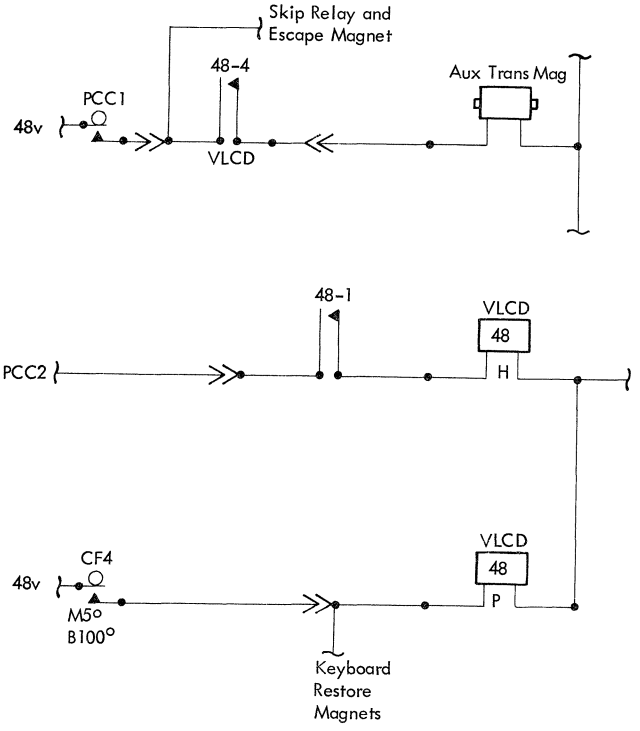


Figure 1-10. Variable-Length Feed Schematic (Wire-Contact Relay)

7. Adjust the gripper-plunger travel (by moving its stop bracket) to grip a card at registration position so that 100 grams (±25 grams) are required to pull it free. When making this adjustment, check to be sure that the plunger is positioned to the extreme left. The entire assembly may then be removed and replaced without affecting registration.

Program-Cam Contacts

These contacts are timed to standard adjustments. The 51-, 60-, and 66-column cam extensions are carried by the 81st-column cam, and require no further timing adjustments.

Pressure Rolls

Feed wheels at punch station are to be open 0.035″ to 0.040″ when the cam roller is on the high point of the cam. Feed wheels at master station are to be open 0.030″ to 0.035″ at the same time. The method of adjustment is same as for standard machines.

Eject Unit

With the card-stop cam roller on the high point of the cam, the register and eject rolls should exert 250 grams to 325 grams pressure on the feed rolls. See "Pressure Rolls."

Detail-Station Card-Lever Contact

The right pressure rail operates the detail-station card-lever contact.

1. With the card lever assembly removed from the machine and the stationary strap straight, the contact should have 0.015″ to 0.020″ air gap (Figure 1-10). Make the adjustment with the assembly held at 45° angle (same angle at which it rests in the machine).

2. The stationary strap must be adjusted so that, with force of 23 grams to 27 grams applied at the center of the lip on the rail, the contacts are closed with a minimum deflection of 0.025″.

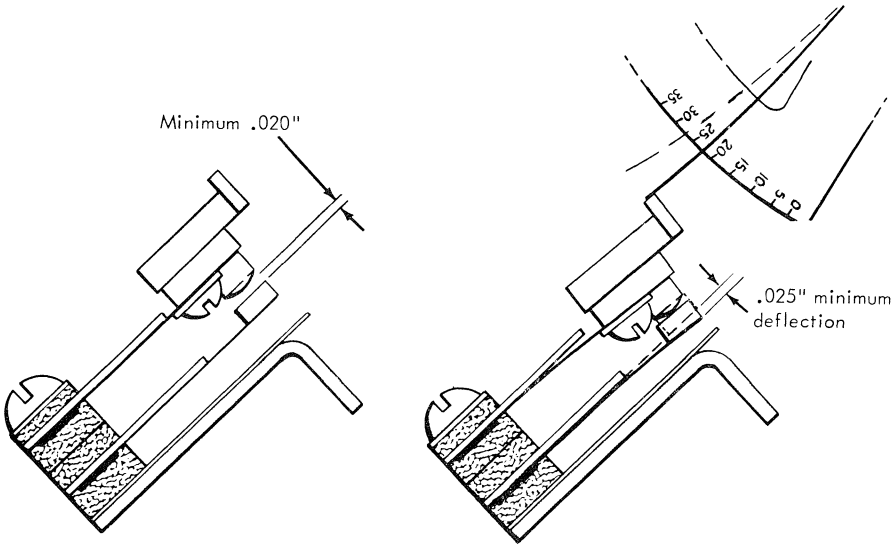


Figure 1-11. Detail-Station Card-Lever Contact

Auxiliary Eject Pressure Roll

Form the auxiliary eject operating arm where it passes over the stacker card guide to allow 0.015″ to 0.020″ clearance between the pressure roll and its feed roll (Figure 1-7). This adjustment must be made when the cam follower is on high dwell.

Auxiliary Eject Feed Roll (Continuously Running)

Adjust the auxiliary eject roll flush with the stacker bed surface by positioning the roll shaft bracket (Figure 1-7). Bracket is mounted to front of main base casting by two screws. During adjustment, maintain slight (but not excessive) backlash to the drive gears.

Auxiliary Eject Cam

Adjust the auxiliary eject cam to cause auxiliary eject pressure roll to contact the continuously running roll at 4° to 8° on the index. Screws that position the cam are accessible through the slot in the stacker plate to the left of the stacker drum.

Auxiliary Transport Mechanism

The auxiliary transport housing (Figure 1-6) should pivot freely on the program shaft.

1. Shim the magnet to obtain armature-to-core clearance of 0.004″ to 0.008″, with the armature seated against the yoke (Figure 1-12).
2. Position the idler roll 0.009″ to 0.012″ above the read-station bed plate by moving the idler-roll mounting plate (Figure 1-13).
3. Adjust the two armature stop screws to allow armature travel of 0.008″ to 0.010″, measured between the yoke and each armature end (Figure 1-12).
4. Move the magnet assembly up or down on the mounting bracket to obtain 0.014″ to 0.017″ clearance between the feed roll and its idler roll (Figure 1-13).
5. Recheck the armature adjustment.
6. Position the idler-roll bracket over the feed roll so that it does not skew a card when the auxiliary transport magnet operates.

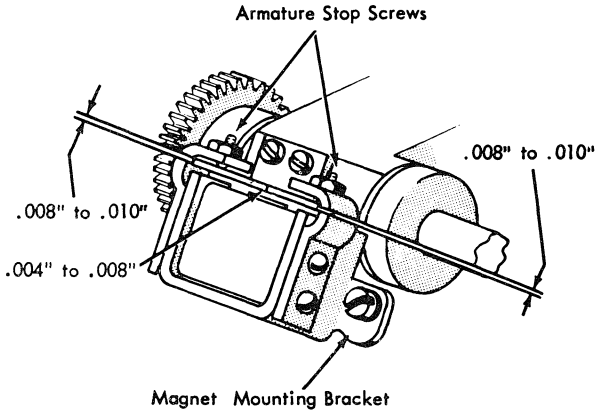


Figure 1-12. Auxiliary Transport Adjustment

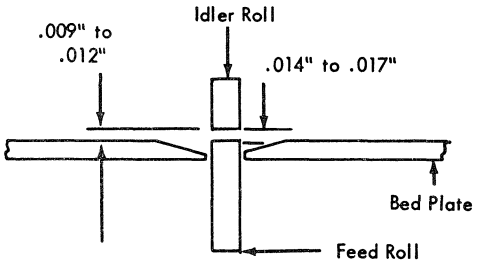


Figure 1-13. Auxiliary Feed and Idler Roll Adjustment

Chapter 2. Interspersed Gangpunch Feature

Theory of Operation

- **This feature recognizes master cards by sensing either an upper-left or upper-right corner cut as they feed from the hopper.**
- **Punching is suspended for a corner-cut master card and the master card passes through the punch station to the read station (automatically) at release speed.**
- **Duplicating is from master card to detail card, or detail card to detail card; never from detail to master, or master to master.**

When the interspersed gangpunch (IGP) switch on the keyboard is off, the feature is inoperative. When the switch is on, corner-cut sensing switches in the card feed determine whether a card is a master or a detail card, depending on the presence or absence of the specified master corner cut. Detail cards must not have the same corner cut as the master cards. The feature requires that the automatic-feed and automatic-duplicating switches be turned on. Because the purpose of the feature is to suspend punching for a corner-cut master card, programming is the same for detail cards as for any normal card punching operation.

With no cards in the card bed, cards in the hopper (the first card a master card and the next a detail card), pressing the feed key for two feed cycles will automatically skip the master card to the read station, register the detail card in the punch station, and put the machine under program control. Once duplicating has started, normal operation under control of the program card continues until the feature recognizes a new master card. At this time, the detail card preceding the master card is at the punch station. The master card stays at the detail (preregister) station while the preceding detail card is duplicated. After the next card-feed cycle, the master card passes the punch station at release speed, and all programming is suspended. A master card requires about 1.25 seconds to pass to the read station. If the next card is also a master card, the process is repeated. When a detail card feeds, it is under normal control of the program drum, and punching is duplicated from the preceding card.

Corner-Cut Option

The interspersed gangpunch feature can be installed on the machine to select master cards *in any one of the following options*:

1. Left corner-cut master cards only.
2. Right corner-cut master cards only.
3. Switch selection of either upper-left or upper-right corner-cut master cards in any interspersed gangpunch operation, but not both in the same operation.

Figure 2-1 is a view of the left side frame as seen from the right side of the card-feed assembly, showing the arrangement of parts necessary to sense a left-hand corner cut in a card. Parts not pertaining to the interspersed gangpunch feature are omitted.

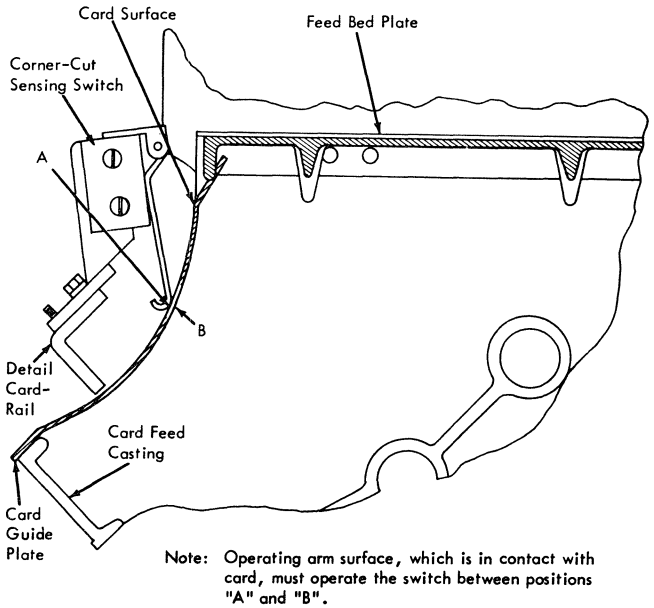


Figure 2-1. IGP Card Feed Assembly

Functional Units

- **Two card feed (CF) cams and circuit breakers are added.**
- **One four-position relay (IGP) is added.**
- **One three-position toggle switch is added to the keyboard.**
- **Two sensing switches are added in the card-feed assembly to sense corner-cut cards.**
- **One diode is added.**

Card Feed Cams (Reed Relay)

Cams CF1 and CF6 are added to the card feed shaft. CF1 provides a pick circuit for the IGP (109) relay through the IGP switch and the corner-cut sensing switches. CF6 holds the IGP relay which allows CF3 to pick RELEASE, Figure 2-2 shows the relative timing of CF1 and CF6 in relation to the sample time of the sensing switches.

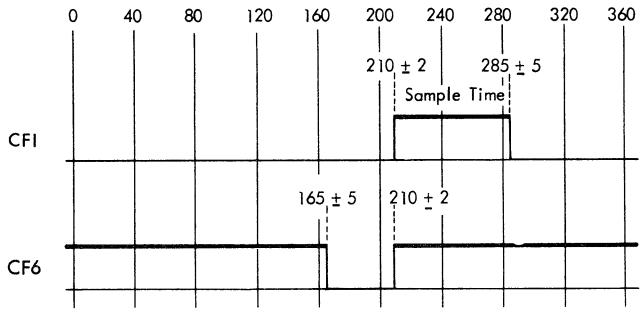


Figure 2-2. IGP Timing (Reed Relay)

Card Feed Cams (Wire-Contact Relay)

Cams CF1 and CF6 are added to the card feed shaft. CF1 provides a pick circuit for the IGP (46) relay through the IGP switch and the corner-cut sensing switches. CF6 holds the IGP relay, which allows CF1 to pick release. Figure 2-3 shows the relative timing of CF1, and CF3, and CF6 in relation to the sample time of the sensing switches.

IGP Switch

This switch turns the IGP feature on and off, and selects either upper-left or upper-right corner-cut master cards.

Corner-Cut Sensing Switches

The sensing switch assemblies are mounted above the feed bed plate to sense left or right corner-cut cards. The IGP switch selects the circuit to pick the IGP relay through either a left corner-cut or right corner-cut master card. The sensing switch contacts are transferred when a card is sensed while passing from the hopper during a feed cycle. If the left sensing switch N/C contact remakes while the right contact is still transferred with the IGP switch set to left corner-cut, the IGP relay is picked.

Principles of Operation

- **This feature automatically releases a master card to the read station after the preceding card has been punched.**

Description (Reed Relay)

The IGP switch controls the selection of left or right corner-cut cards as master or detail cards. The corner cut is sensed by the contact action of two switches (Figure 2-4) as a card passes under them during a card-feed cycle. When a left corner-cut is sensed, the left sensing switch returns to the N/C position 8° to 10° before the right sensing switch does. If this happens during "sample time" (CF1 made), a left corner cut is sensed and the IGP relay is picked. A right corner cut is sensed by a similar circuit, but the right sensing switch returns to the N/C position first. The IGP relay is held through its own point and CF6.

On the next card-to-card skip, PCC2 picks the card-feed clutch. During this feed cycle, CF3 picks the release relay instead of the card-lever relay at 70°, and the master card is released through the punch station. At 165°, CF6 opens and drops the IGP relay.

Circuit Objectives (Reed Relay)

Figure 2-4 is a schematic and is not intended as a point-to-point wiring diagram.

1. Pick IGP (109) relay. Feed-unit sensing switch. IGP switch.
2. Hold IGP relay. 109-1. CF6.
3. Pick release relay. 109-4. CF3.
4. Drop IGP relay. CF6.

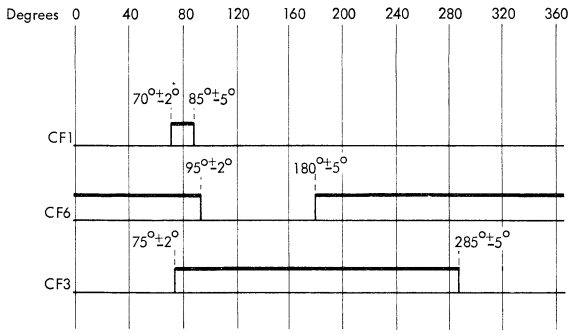


Figure 2-3. IGP Timing (Wire-Contact Relay)

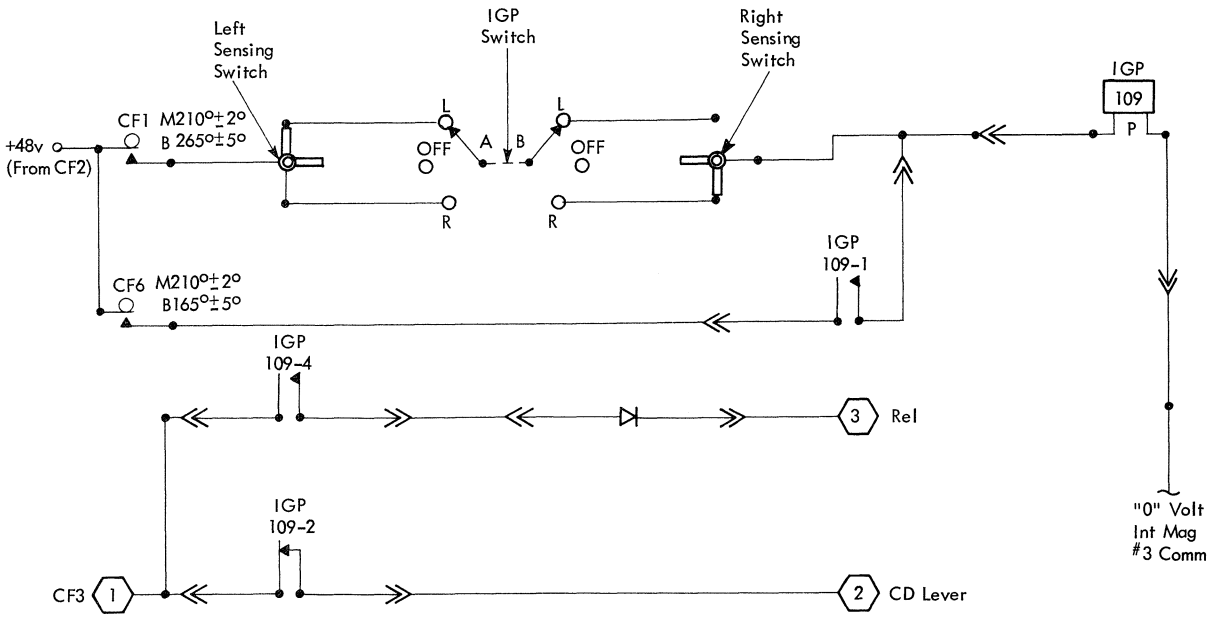


Figure 2-4. IGP Schematic (Reed Relay)

Description (Wire-Contact Relay)

The IGP switch controls the selection of left or right corner-cut cards as master or detail cards. The corner cut is sensed by the contact action of two switches (Figure 2-5) as a card passes under them during a card-feed cycle. When a left corner-cut is sensed, the left sensing switch returns to the N/C position 8° to 10° before the right sensing switch does. If this happens during "sample time" (CF1 made), a left corner cut is sensed and the IGP relay is picked. A right corner cut is sensed by a similar circuit, but the right sensing switch returns to the N/C position first. The IGP relay is held through its own point and CF6.

On the next card-to-card skip, PCC2 picks the card feed clutch. During this feed cycle, CF1 picks the release relay instead of the card-lever relay at 70°, and the master card is released through the punch station. At 95°, CF6 opens and drops the IGP relay.

Circuit Objectives (Wire-Contact Relay)

Figure 2-5 is a schematic and is not intended as a point-to-point wiring diagram.

1. Pick IGP (46) relay. Feed-unit sensing switch. IGP switch.
2. Hold IGP relay. 46-1. CF6.
3. Pick release relay. 46-2 N/O. CF1. CF3.
4. Drop IGP relay. CF6.

Maintenance

Checks

1. CF1 and CF6 are added for this feature. Replace badly pitted or worn points. Check for worn operating arm rollers.

2. Check the adjustment of the sensing switch operating arms, and the CF cams.

Adjustments

1. The sensing switch shall operate from "B" outer surface of operating arm flush with underside of card

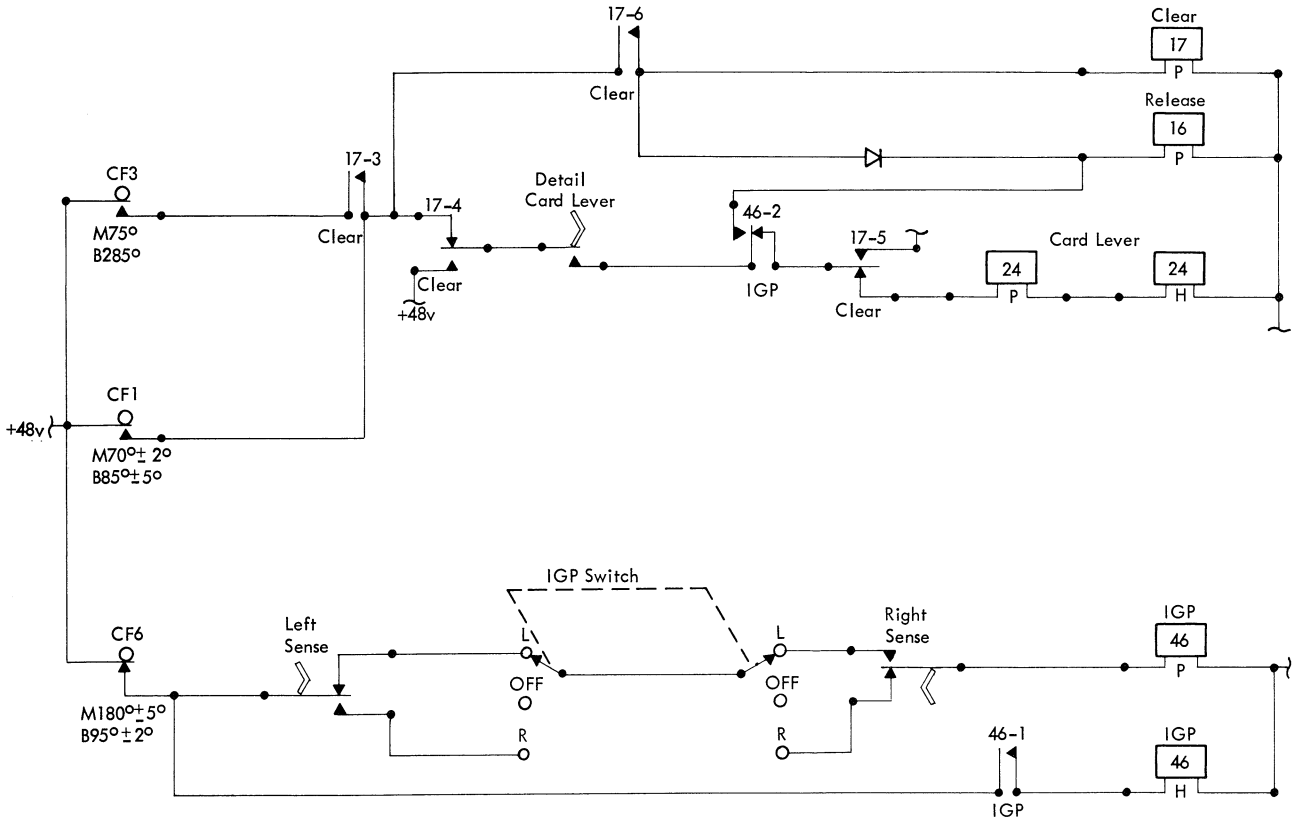


Figure 2-5. IGP Schematic (Wire-Contact Relay)

guide, to "A" inner surface of operating arm flush with top surface of card guide. See Figure 2-6.

2. Operate the arm several times to make sure it returns to the slot in the card guide and does not come to rest on the plate. Reposition the bracket to attain this location, if necessary.

3. Adjust CF1 and CF6 to the values given on the wiring diagram.

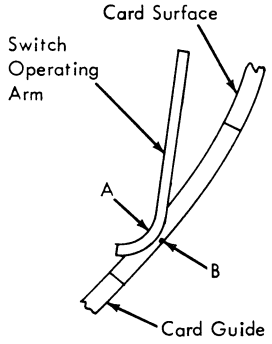


Figure 2-6. IGP Corner-Cut Sensing Switch Operating Adjustment

Chapter 3. Auxiliary Duplication Feature

Theory of Operation

- **This feature permits duplicating information from a master card rather than from the card at the reading station.**
- **A separate drum unit (auxiliary drum) holds the master card and is controlled from the keyboard by the auxiliary-duplicate (AUX-DUP) key.**
- **The field to be duplicated from the master card to the detail card is defined in the program card.**

The master card information is punched into the auxiliary-drum card and fastened around an auxiliary drum. The auxiliary drum is inserted in the machine on a spindle that is located in back of the program drum and driven in step with the program drum. The auxiliary-drum starwheels must be raised and lowered when the auxiliary drum is inserted or removed.

The AUX-DUP key on the keyboard starts auxiliary duplication, which continues under the control of the field-definition punches in the program card. The punches in the auxiliary duplicating card are read one column ahead of the detail card by starwheels similar to the program starwheels. The master information in the auxiliary-drum card must be in the same columns defined for duplication by the program card.

Auxiliary duplication is useful when:

1. Common information is required for certain cards but not for others.
2. Major-minor duplicating is performed.
3. Prepunched master cards are inserted.

In major-minor duplicating, the major data can be dropped when:

1. The AUTO-SKIP-DUP switch is turned off for a change of information in the minor field.
2. Prepunched master cards are used. Any information common to all cards (such as date) is dropped when a new master card is inserted.

In either case, the master information can be punched in the first detail card of each group, with one key depression and without reference to a source document.

Functional Units

- **The auxiliary duplication drum shaft is driven by the escapement gear train under control of the escapement mechanism.**
- **A starwheel sensing unit reads the information from the master card attached to the auxiliary drum to energize the interposer magnets.**

The auxiliary duplication sensing assembly can be factory- or field-installed on the underside of the base unit. The gears are meshed so that column 1 of the auxiliary duplication drum will coincide with column 1 of the standard program drum. The auxiliary starwheel timing is adjusted the same as for starwheel timing on the standard program drum.

On reed-relay machines, a four-position reed relay is added to location 130 on the circuit for this feature. The additional wiring and circuits are shown on the replacement page (part 5373564) for sections 1 and 2 of the machine wiring diagram.

On wire-contact relay machines, relay 49 is added to the circuit. The additional wiring and circuits are shown on the replacement page (part 5405965) for sections 1 and 2 of the machine wiring diagram.

Principles of Operation

- **The AUX-DUP key starts the operation.**
- **Programmed: The field-definition code continues the operation to the end of the field.**
- **Unprogrammed: The AUX-DUP key must be pressed and released for each cycle of operation.**

Description

Pressing the auxiliary duplication key closes its latch contact and provides +48 volts to energize the aux-dup relay and the dup 1 and dup 2 relays. With program control, a hold for the aux-dup relay is provided by the same circuit for dup 1 and dup 2 relays to the field-definition starwheels. The common line to the read station pin contacts is opened, and the common line to the auxiliary duplicating contacts is closed.

The operation is similar to an automatic duplication operation except that the interposer magnets are energized from the sensing of holes punched in the master card on the auxiliary drum instead of the sensing of holes punched in the master card at the read station. The field-definition starwheel contacts on the program drum continue the auxiliary duplication to the end of the field.

Without program control (for example, program starwheels raised), the AUX-DUP key must be pressed for each cycle of operation. The operation is similar to a manual duplication operation without program control.

Circuit Objectives (Reed Relay)

Figure 3-1 is a schematic and is not intended as a point-to-point wiring diagram.

Programmed

1. Pick aux-dup relay and dup 1 and dup 2 relays. Aux-dup latch contact. Dup 2 is picked at P3 time of first punch cycle.
2. Hold aux-dup relay and dup 1 and dup 2 relays. Field definition.
3. Sense the auxiliary-drum card. 130-4 N/O. 120-1 N/O.
4. Energize keyboard restore magnets. 114-1 N/O.
5. Escape and punch cycles continue until the end of field definition.

Unprogrammed

1. Pick aux-dup relay and dup 1 relay. Aux-dup latch contact. Dup 2 is picked at P3 time of first punch cycle.
2. Hold aux-dup relay and dup 1 relay. P4 (175°-355°) or escape interlock N/C.
3. Pick and hold dup 2 relay. P3 (10°-60°). P4 (175°-355°) or escape interlock N/C.
4. Sense the aux-drum card. 120-1 N/O. 130-4 N/O. P5 (86°-166°).
5. Energize keyboard restore magnets. 114-1 N/O.
6. One escapement and two punch cycles result from each depression of the AUX-DUP key. Aux-dup latch contact.

Circuit Objectives (Wire-Contact Relay)

Figure 3-2 is a schematic and is not intended as a point-to-point wiring diagram.

Programmed

1. Pick aux-dup relay and dup 1 and dup 2 relays. Aux-dup latch contact. Dup 2 is picked at P3 time of first punch cycle. (Dup 3 cannot be picked.)
2. Hold aux-dup relay and dup 1 and dup 2 relays. Field definition.
3. Sense the auxiliary-drum card. 49-2 N/O. P5.
4. Energize keyboard restore magnets. 7-6 N/O.
5. Escape and punch cycles continue until the end of field definition.

Unprogrammed

1. Pick aux-dup relay and dup 1 relay. Aux-dup latch contact. Dup 2 is picked at P3 time of first punch cycle.

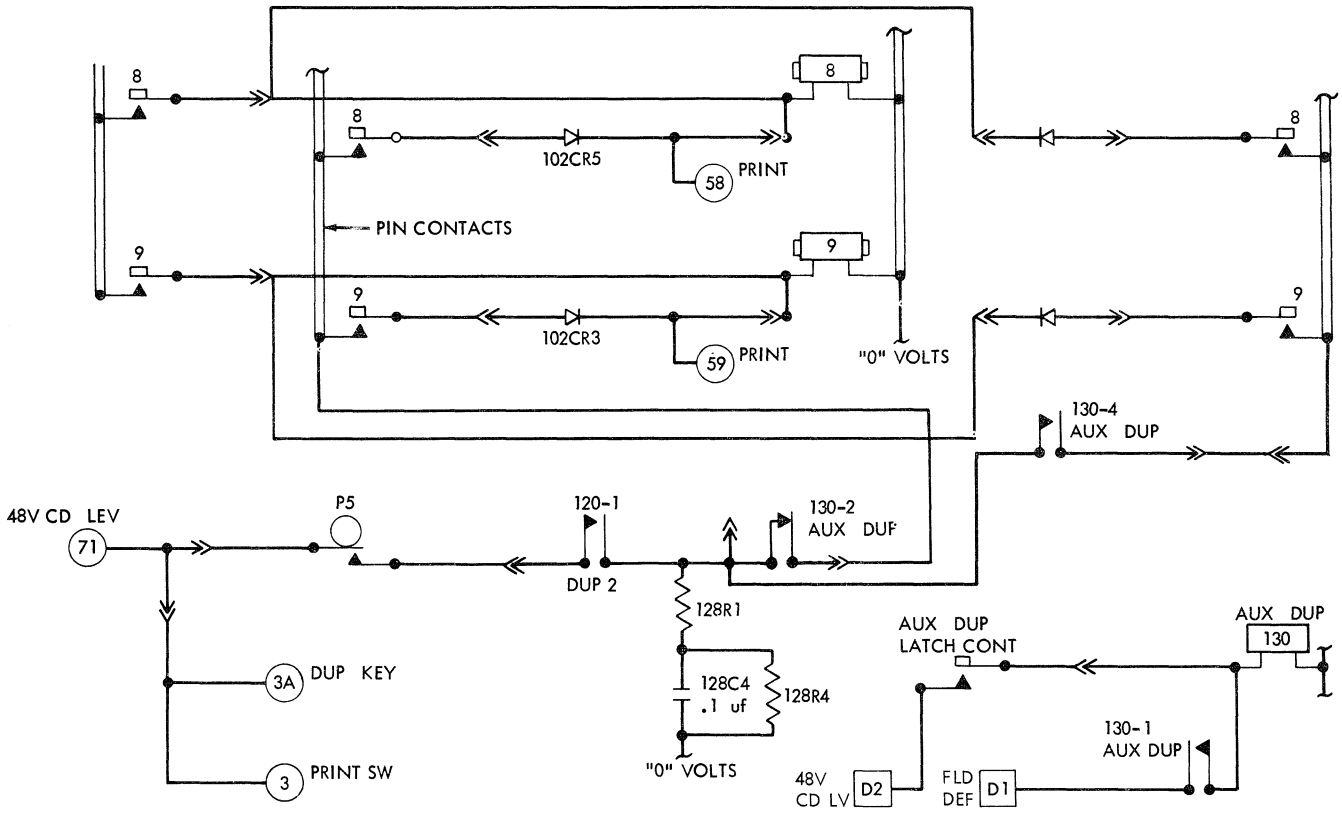


Figure 3-1. Auxiliary Duplication Schematic (Reed Relay)

2. Hold aux-dup relay and dup 1 relay. P4 (175°-355°) or escape interlock N/C.
3. Pick and hold dup 2 relay. P3 (5°-65°). P4 (175°-355°) or escape interlock N/C.
4. Sense the aux-drum card. 49-2 N/O. P5 (86°-166°).
5. Energize keyboard restore magnets. 7-6 N/O.
6. One escapement and two punch cycles result from each depression of the AUX-DUP key. Aux-dup latch contact.

Maintenance

Checks and Adjustments

Refer to Field Engineering Maintenance Manual, *IBM 29 Card Punch*, Form 225-3357, "Program Auxiliary Drum Unit."

Removal and Replacement

The auxiliary duplication sensing assembly must be timed to the program index.

1. Punch a card in column 1 and place it on the auxiliary drum.

2. With the program unit at column 1, install the auxiliary duplicate sensing unit so that the starwheels are reading column 1.

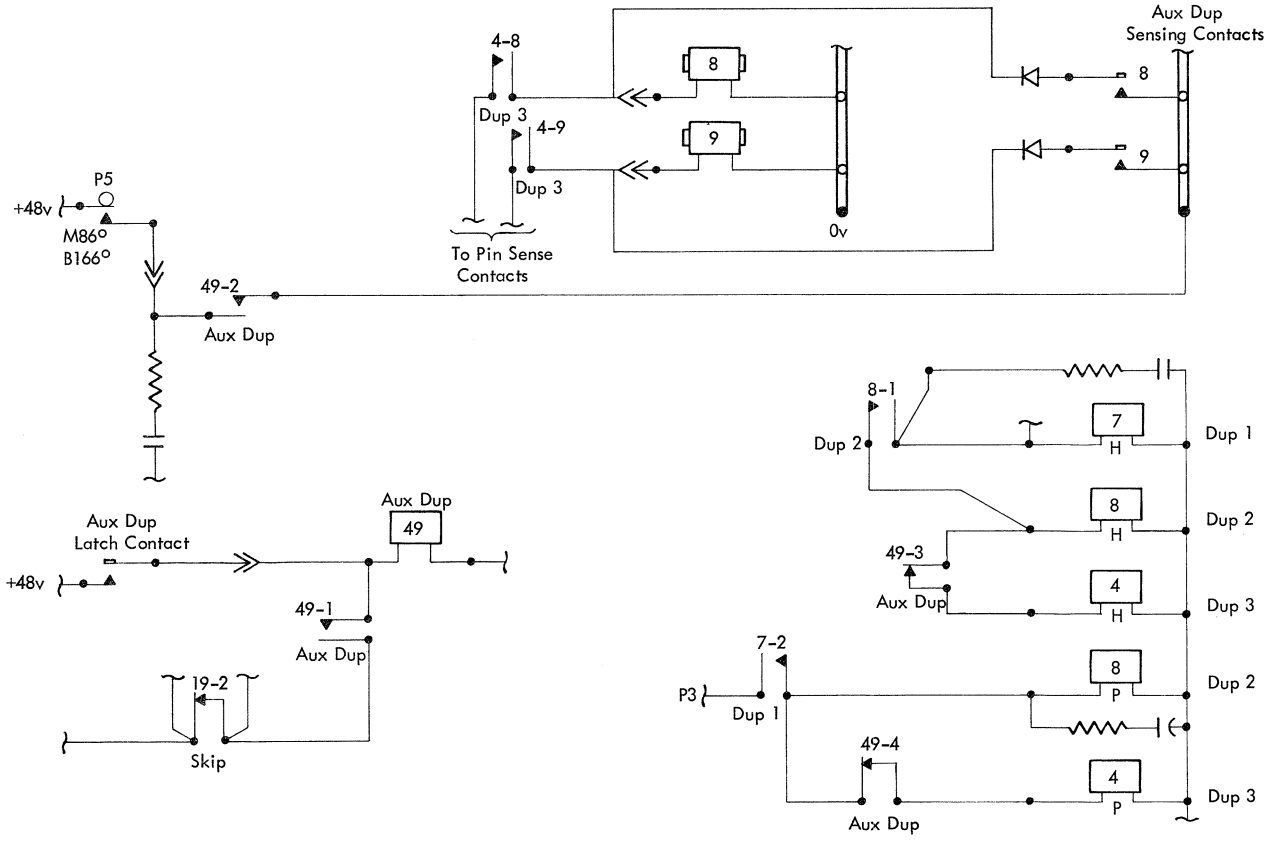


Figure 3-2. Auxiliary Duplication Schematic (Wire-Contact Relay)

Chapter 4. High-Speed Skip Feature

Theory of Operation

- **High-speed skip rate is three times normal skip speed.**
- **High-speed skip is under program control.**
- **The last five columns following a high-speed skip field must be programmed for a normal skip operation.**

The high-speed skip feature provides the greatest advantage for those applications that require skipping many consecutive columns of the card. This feature can be installed on a card punch that has a variable-length feed.

High-speed skipping is program-controlled and operates in conjunction with standard skipping. High-speed skipping is accomplished at the rate of about three times the standard skip speed and results in a saving of 8 milliseconds per column skipped at high speed.

The sensing mechanism is positioned in such a way that five columns at the end of the field have to be reserved for drop-out (slowing down the skipping speed) to maintain proper registration of the card.

When this feature is installed on a machine with the variable-length feed feature, card output can be increased. The missing portion of these cards (columns 51-75, or 60-75) is skipped at high speed. The last five columns must be skipped at a slower speed.

Program Control

For high-speed skipping, punch the program card as follows:

Program 1

11 in the first column of the high-speed skip field.
1's in all columns to be high-speed skipped, except the last five columns of the skip field.
12's in all columns of the skip field except the first column.

Program 2

5 in the first column of the high-speed skip field.
7's in all columns to be high-speed skipped, except the last five columns of the skip field.
4's in all columns of the skip field except the first column.

The five columns at the end of a high-speed skip *must* be a regular skip field, to allow the escapement to slow down gradually and keep the card in proper registration.

Functional Units

- **A high-speed clutch and drive mechanism are added to the IBM 29.**

The drive motor drives the cog-belt pulley at high speed. The gear attached to the pulley drives the 60-tooth spur gear that is pinned to the high-speed clutch shaft (Figure 4-1).

During normal escape operation, the clutch gear rotates freely on the high-speed-clutch shaft. On the face of the clutch-gear assembly are three projecting pins that slip into corresponding holes in the high-speed-clutch armature. This allows the armature to travel freely in the direction of the magnet. The rotor is the core of the clutch magnet and is keyed and setscrewed to the high-speed-clutch shaft.

When the clutch magnet is energized, the rotor attracts the armature. This magnetically locks the clutch gear to the high-speed shaft. The clutch gear then drives the 56-tooth gear at high speed. The normal friction drive is overdriven, and cards are moved at high speed.

When the high-speed-clutch magnet is de-energized, the normal escape mechanism is in operation.

Principles of Operation (Reed Relay)

- **Auto-skip is initiated and the high-speed skip circuits are picked and held by the standard skip relays.**

Description

An auto-skip operation is started by the program card. The HSS1 (109) relay is then picked by the standard skip relays. The 109 relay switches the escape magnet armature contact from the escape interlock circuitry to the high-speed skip circuitry. If a 1 in program 1 or a 7 in program 2 is punched in a programmed skip field, the 1 or 7 starwheel will energize the HSS clutch through the escape magnet armature contact.

The high-speed clutch provides a driving force to the escape gear train, which overpowers the friction clutch and drives the escapement at high speed. When the end of the field of 1's in the program card is reached, the high-speed skip clutch is de-energized. The following five columns are a standard skip field to enable the escapement drive to return to normal skip speed before the escape armature engages.

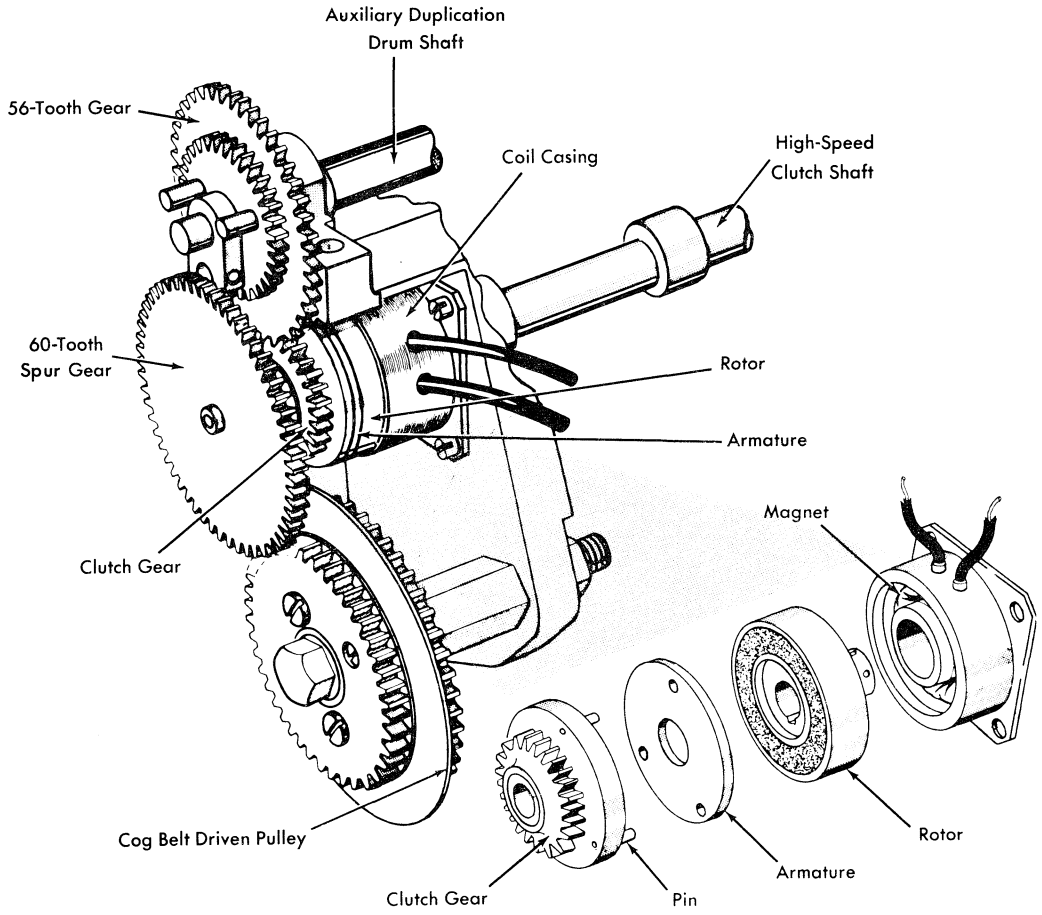


Figure 4-1. High-Speed Clutch

A high-speed skip is prevented when the skip is initiated from the keyboard. Pressing either the skip or release key picks the HSS2 (118) relay and prevents the pick of HSS1 (109) relay and the high-speed skip clutch.

Circuit Objectives

Figure 4-2 is a schematic and is not intended as a point-to-point wiring diagram.

During a programmed skip operation, energize the high-speed clutch and cause a high-speed skip:

1. Pick HSS1 relay. Same path as skip relays.
2. Switch escape magnet armature contact from escape interlock circuitry to HSS circuitry. 109-2 N/C. 109-4 N/O.
3. Energize HSS clutch. Escape armature contact. Starwheel 1 or 7.

Prevent high-speed-skip through skip or release key:

1. Pick HSS2 relay. Skip or release latch contact. (Hold through field definition.)
2. Open circuit to HSS clutch. 118-3 N/C. 118-1 N/O holds HSS2.

Principles of Operation (Wire-Contact Relay)

- **Auto-skip is initiated and the high-speed skip circuits are picked and held by the standard skip relay.**

Description

An auto-skip operation is started by the program card. The HSS (46) relay is then picked by the standard skip relay. The HSS relay switches the escape magnet armature contact from the escape interlock circuitry to the high-speed skip circuitry. If a 1 in program 1 or a 7 in program 2 is punched in a programmed skip field, the 1 or 7 starwheel will energize the HSS clutch through the escape magnet armature contact.

The high-speed clutch provides a driving force to the escape gear train, which overpowers the friction clutch and drives the escapement at high speed. When the end of the field of 1's in the program card is reached, the high-speed skip clutch is de-energized. The following five columns are a standard skip field to enable the escapement drive to return to normal skip speed before the escape armature engages.

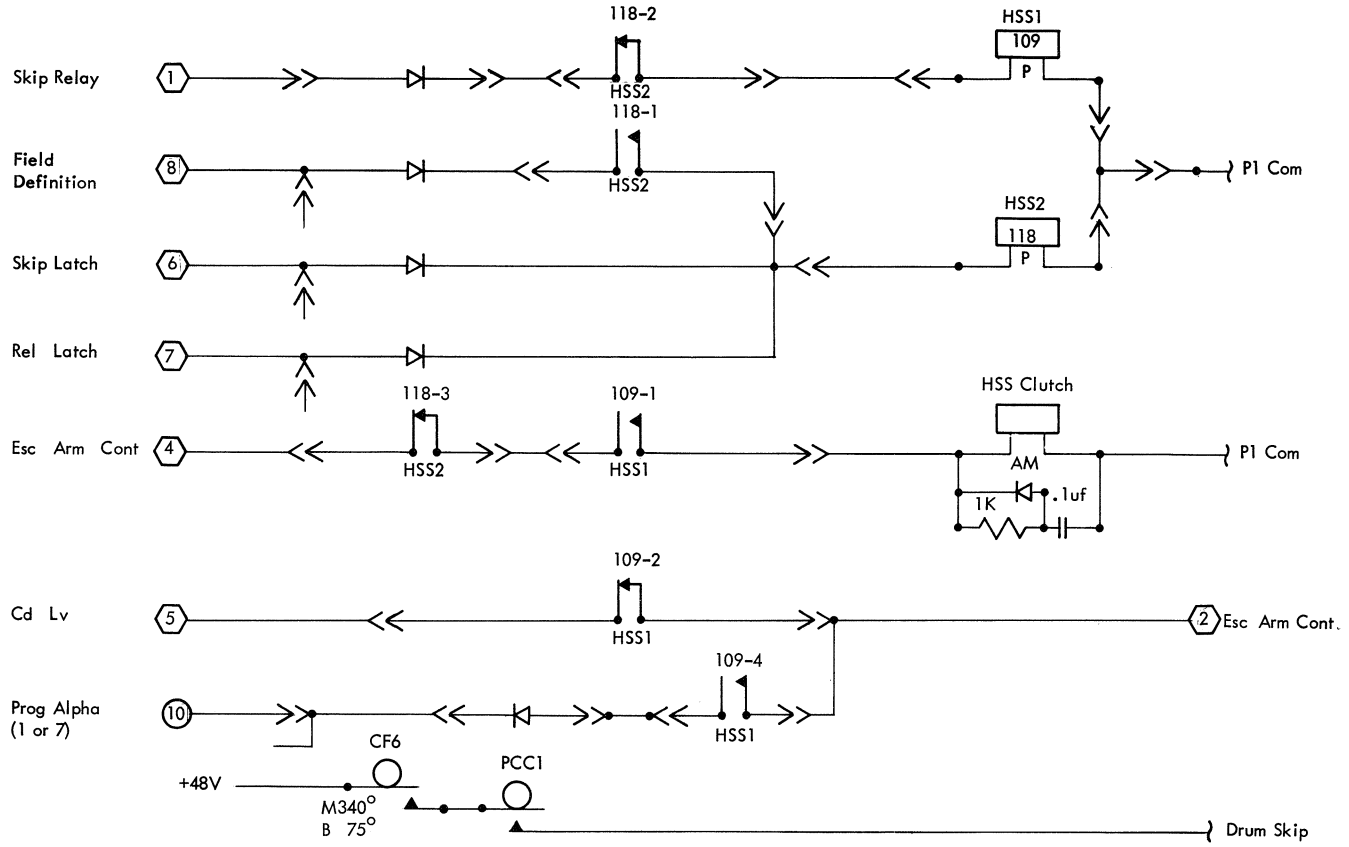


Figure 4-2. High-Speed Skip Schematic (Reed Relay)

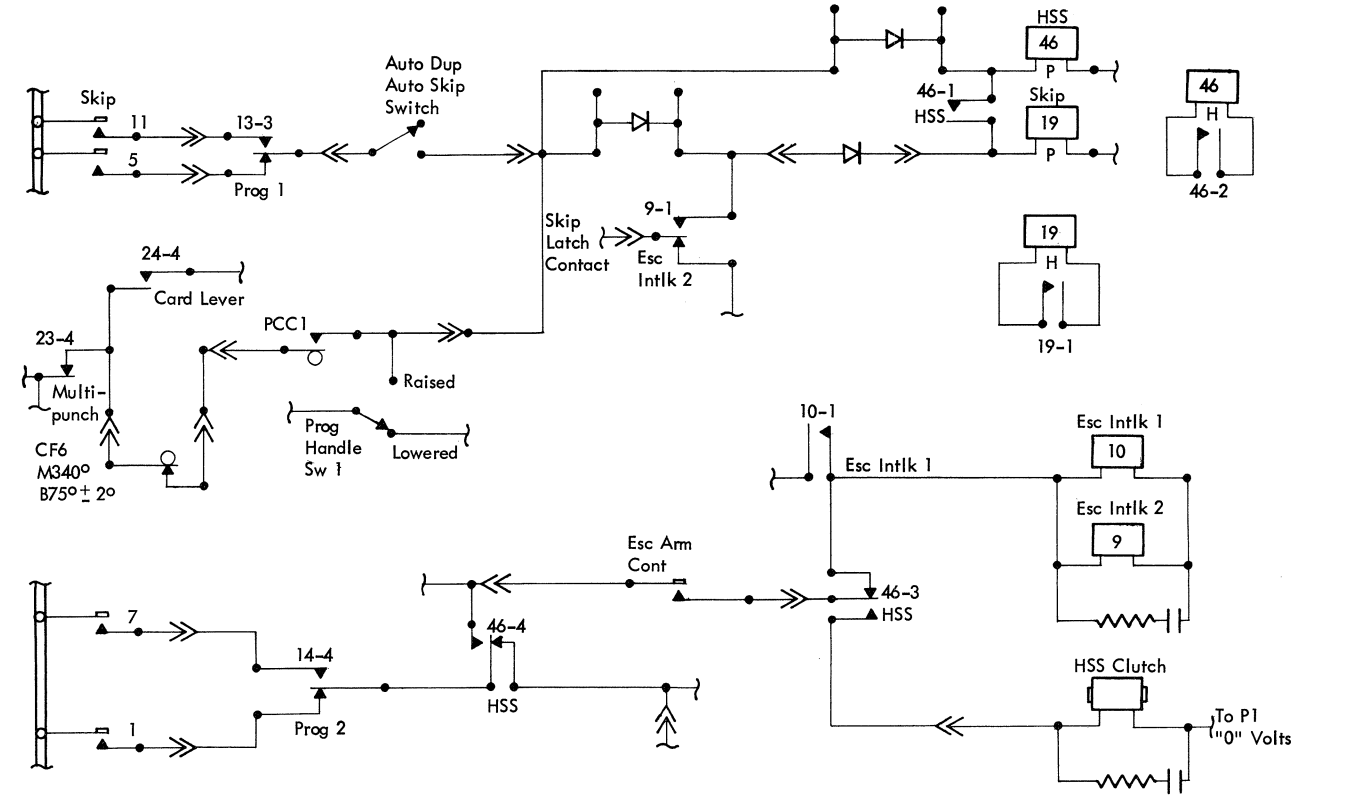


Figure 4-3. High-Speed Skip Schematic (Wire-Contact Relay)

Circuit Objectives

Figure 4-3 is a schematic and is not intended as a point-to-point wiring diagram.

During a programmed skip operation, energize the high-speed clutch and cause a high-speed skip:

1. Pick HSS relay. Same path as skip relay.
2. Switch escape magnet armature contact from escape interlock circuitry to HSS circuitry. 46-3 N/O. 46-4 N/O.
3. Energize HSS clutch. Escape armature contact. Starwheel 1 or 7.

Maintenance

Overlubrication of the clutch gear may allow grease to enter the clutch and cause torque failures.

DANGER

When you check the friction drive on a machine with the high-speed skip feature, be certain that the starwheels are raised. Otherwise there is a possibility of injury if the high-speed clutch picks, bypasses the friction-clutch drive, and turns the gears directly at high speed.

Adjustments

To adjust clutch armature clearance, the high-speed skip unit must be removed.

1. Remove large cog-belt drive pulley (Figure 4-1) and cog belt.
2. Remove the four mounting screws holding high-speed skip casting. These screws are accessible from the rear of the machine; lower right screw is behind high-speed skip clutch.
3. Drive taper pin on split yoke gear assembly.
4. Remove the four mounting screws on magnetic clutch housing.
5. Loosen setscrews in the two high-speed clutch shaft collars or hubs.
6. Pull high-speed clutch and shaft assembly out of casting. Split yoke gear assembly must be removed as high-speed clutch and shaft assembly is pulled out of casting. NOTE: Lower right high-speed casting mounting screw (step 2), which has been held in place by the clutch assembly, may fall out at this time.
7. Loosen allen setscrews (inside magnetic clutch housing) that hold clutch armature to shaft.
8. Adjust clutch armature to provide 0.010″ ±0.002″ clearance between armature and clutch. For this adjustment, use two feeler gages, one on each side of shaft. Tighten setscrews. When two feeler gages are not available, two IBM cards may be used.
9. Replace lower right casting screw. This screw cannot be inserted after high-speed clutch assembly is in place.
10. Push clutch and shaft assembly into casting. Place split yoke gear assembly on its shaft before clutch shaft is fully inserted. Assemble the two clutch shaft collars on shaft.
11. Replace pin in split yoke gear assembly.
12. Push clutch shaft into casting as far as possible. While holding shaft in this position, pull clutch shaft collar against bearing nearest clutch assembly, and tighten setscrews in collar.
13. Mount magnetic clutch housing loosely. Locate housing so that rotor does not touch housing at any point, and tighten housing screws. Clutch shaft should rotate freely after this adjustment.
14. Tighten clutch shaft collar farthest from clutch assembly to eliminate shaft end-play. Clutch shaft should turn freely without binding.
15. Replace high-speed skip casting assembly in machine. Be careful not to disturb pin sense unit wiring and punch drive unit wiring when installing high-speed skip casting to base. These wires are not accessible after high-speed skip casting is installed.
16. When reassembling high-speed-skip casting on machines equipped with auxiliary duplication, time the auxiliary duplication shaft to the program drum shaft.
17. Install large cog-belt drive gear and cog belt. Adjust belt tension for a slightly loose condition (a tight cog belt becomes noisy).

NOTE: The clutch face and rotor are factory run-in matched assemblies; replacement of these parts may require changing the complete unit.

Theory of Operation

- A toggle switch in the program drum area allows the operator to select either 48- or 64-character mode of operation.
- In 48-character mode, 16 special characters are inhibited.

The character inhibit feature on the IBM 29 Card Punch allows the operator to select, by means of a switch, either 48- or 64-character mode of operation; when the switch, located to the left of the program drum, is set to the 48-character mode, keying and punching of the following special characters are inhibited:

12-8-2	12-8-5	12-8-6	12-8-7	11-8-2	11-8-5	11-8-6	11-8-7
¢	(	+	|	!	)	;	¬
0-8-2	0-8-5	0-8-6	0-8-7	8-2	8-5	8-6	8-7
blank	—	>	?	:	'	=	"

In numeric shift and 48-character mode, the keyboard locks if one of the described characters is keyed. Pressing the error reset key restores the keyboard.

Principles of Operation

- Inhibit relay, R92, must be picked prior to punching any character.
- To inhibit the 16 special characters, R92 is prevented from picking.

Wiring diagrams for the character inhibit feature on either a wire-contact or reed-relay machine are in Appendix B of this publication. Figure 5-1 is a simplified circuit diagram.

To allow punching of any character, relay 92 must be picked. When the mode switch is in the 64-character position, R92 is picked and held through its hold coil for as long as the switch remains in that position.

To inhibit the 16 special characters when the mode switch is in the 48-character position, R92 must not be picked. All 16 characters that are inhibited contain an 8-punch and at least a 2-, 5-, 6-, or 7-punch. When any character key is pressed, +48v is applied to the A-side of R92. The B-side of the relay has two gated paths to 0v. Each of the two gates is connected to a keyboard output. If the 8-interposer keyboard output is energized, +48v is applied to one leg of the B-side of R92. If the 2-, 5-, 6-, or 7-interposer keyboard output is energized, +48v is also applied to the other leg on the B-side of R92. The relay is not picked, and punching is inhibited.

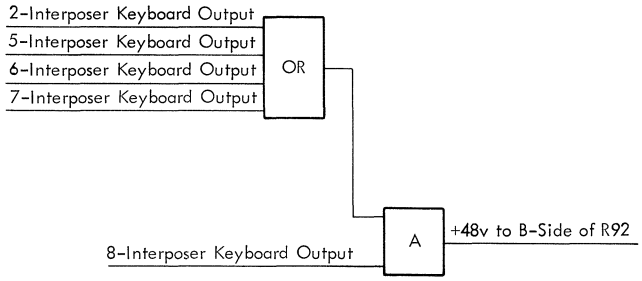


Figure 5-1. Character Inhibit Logic

Chapter 6. Mutilated-Card Feed Feature

Theory of Operation

To help feed mutilated cards, a notched throat knife replaces the standard throat knife, and the hopper throat clearance is increased. The eject and pin-sensing units are manufactured with increased throat clearances to allow mutilated-card processing.

Maintenance

The following adjustments apply only to machines having mutilated-card feed units installed. The eject-unit throat clearance is factory-set for 0.020″ to 0.026″.

Adjustment

1. Adjust the throat knife opening for clearance of 0.010″ to 0.011″ (Figure 5-1).
2. Adjust the master-station card guide for clearance to card bed of 0.025″ to 0.030″.
3. The plastic guide that projects from the eject unit should clear above the stacker bed plate $\frac{1}{32}$″ to $\frac{1}{16}$″.
4. Spring tension of the card-feed pusher plate should not exceed 6½ turns of the spring shaft.

Theory of Operation

- **The card lifter is useful on machines that have unattended operation.**
- **The card lifter is added to the feed unit to lift the card up against the detail-station upper card rail.**

For a card to remain in registration during column-by-column movement through the punch station, the card must be up against the upper card rail. With cards in the hopper, the card aligner fingers, on the first portion of the card feed, move the card down from under the upper card rail and into the detail-card station. The function of the card lifter is to give an additional lift to the card after the aligner fingers have pushed the card forward. This is most beneficial on unattended machines where an operator is not continuously present. *Fingers* of the card lifter lift the card up from under the upper card rail. The card pusher arm pushes the card along the upper card rail and into the punch station for registration.

Functional Units

- **The card lifter is actuated by a link that is mounted on the card aligner shaft.**

Figure 7-1 is a right-end cross-sectional view of the feed unit with the card lifter installed. The card lifter turns freely on the upper feed-roll shaft. The card lifter is actuated by a pin that is connected to a link mounted on, and under control of, the card aligner shaft. During a card feed, the card lifter is first pulled back and down out of the path of a card feeding from the hopper. After the aligner fingers have pushed the card forward, the link forces the pin forward to raise the card lifter fingers against the bottom of the card. Note in Figure 7-1 that a spring is mounted on the pin to cushion the forward motion of the pin against the card lifter.

Maintenance

Make certain that the lifter is free of binds and rotates freely on the shaft.

Adjustment

Form the card lifter so that at 15 degrees of a card feed cycle there is 0.006″ to 0.020″ clearance between the upper edge of the lifter fingers and the front surface of the detail upper card guide (Figure 7-1). On machines with *mutilated-card feed*, this adjustment is 0.013″ to 0.045″.

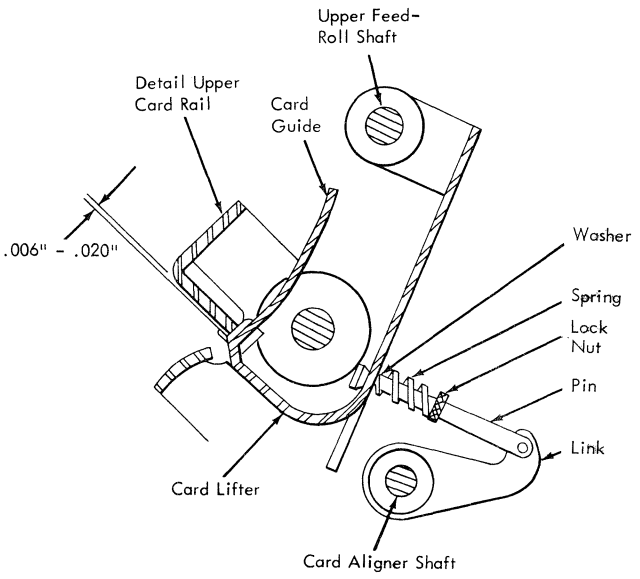


Figure 7-1. Card Lifter

Chapter 8. Reading Board Extension Feature

• **This feature increases reading-board area.**

The reading-board extension on the IBM 29 is an attachable board that can be field-installed (Figure 8-1). The extension is mounted to the left side of the standard reading board and held in place by bolts secured to permanently inserted fasteners under the standard reading board.

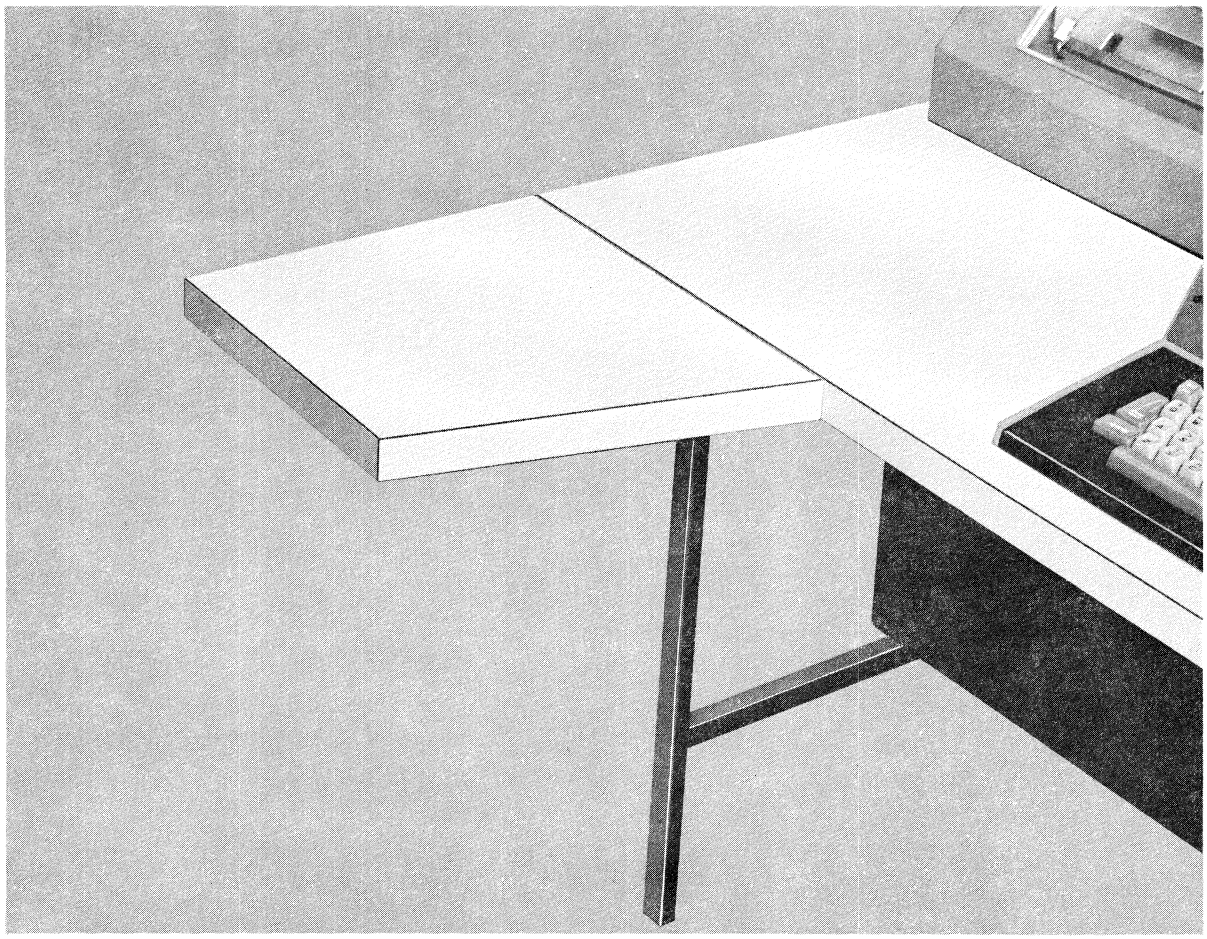


Figure 8-1. Reading-Board Extension

Chapter 9. Card Insertion Feature

Theory of Operation

- This feature permits the manual insertion of a card at the read station or in the hopper.
- The feature switch located on the keyboard switch panel selects the insert or stack mode of operation.
- The operation is initiated when the master card (MC) key is pressed after the last detail card is registered and before column 80 of that card.

This feature simplifies the manual insertion of a master duplicating card in front of a group of cards to be punched, or the insertion of a blank or prepunched trailer card at the end of a group of punched cards.

Functional Units

A punch-station registration magnet is mounted on the base, to the right of the escapement magnet, and a latch is mounted on the pusher arm shaft (Figure 9-1). When the punch-station registration magnet is energized, its armature engages the latch to prevent the card pusher arm from moving the detail card into the punch station.

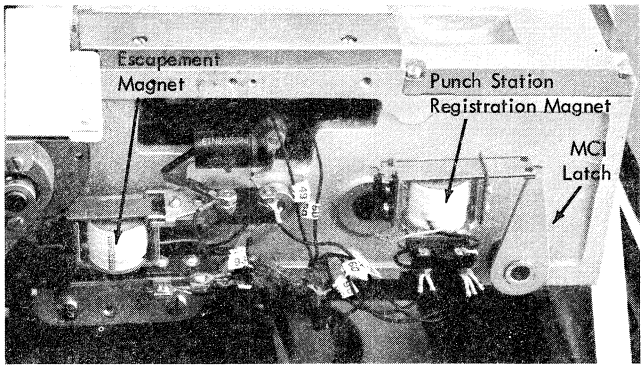


Figure 9-1. Master-Card Insertion

Principles of Operation

- The *insert* operation consists of a register cycle, followed by a release cycle.
- The *stack* operation consists of a register cycle, followed by a release cycle, followed by a register cycle.

When the master card switch is set on INSERT:

1. The card that was punched at the punch station releases through the master station and read station and stops in the eject (pre-stack) station.
2. A new master card can be manually inserted in the master station.
3. Press the feed key to: register the master card at the read station, register the detail card at the punch station, and feed a card from the hopper.

When the MC switch is set on STACK:

1. The card that was punched at the punch station is released through the master station and the read station and stacked. The card in the detail station is registered in the punch station, and a card is fed from the hopper.
2. A new master (trailer) card can be inserted manually behind the cards in the stacker.

Description (Reed Relay)

Wiring diagram part 5373562 replaces section 5 and 6 of the machine wiring diagram with this feature. Wiring diagram part 5373563 replaces section 7 and 8 of the machine wiring diagram with this feature.

Figure 9-2 shows the conditions that pick or activate the main operating components of the card-insertion feature.

Insert Operation

1. Set the card insertion switch to INSERT. The autofeed switch must be on.

2. After registering or while punching the last detail card preceding the master card to be inserted, press the MC (master card) key. The MC key must be pressed before column 80 is reached. The MCI key latch contact picks MCI relay 119. The 119-4 and 119-5 points transfer PCC2 N/O to the CF latch magnet during a card-to-card skip.

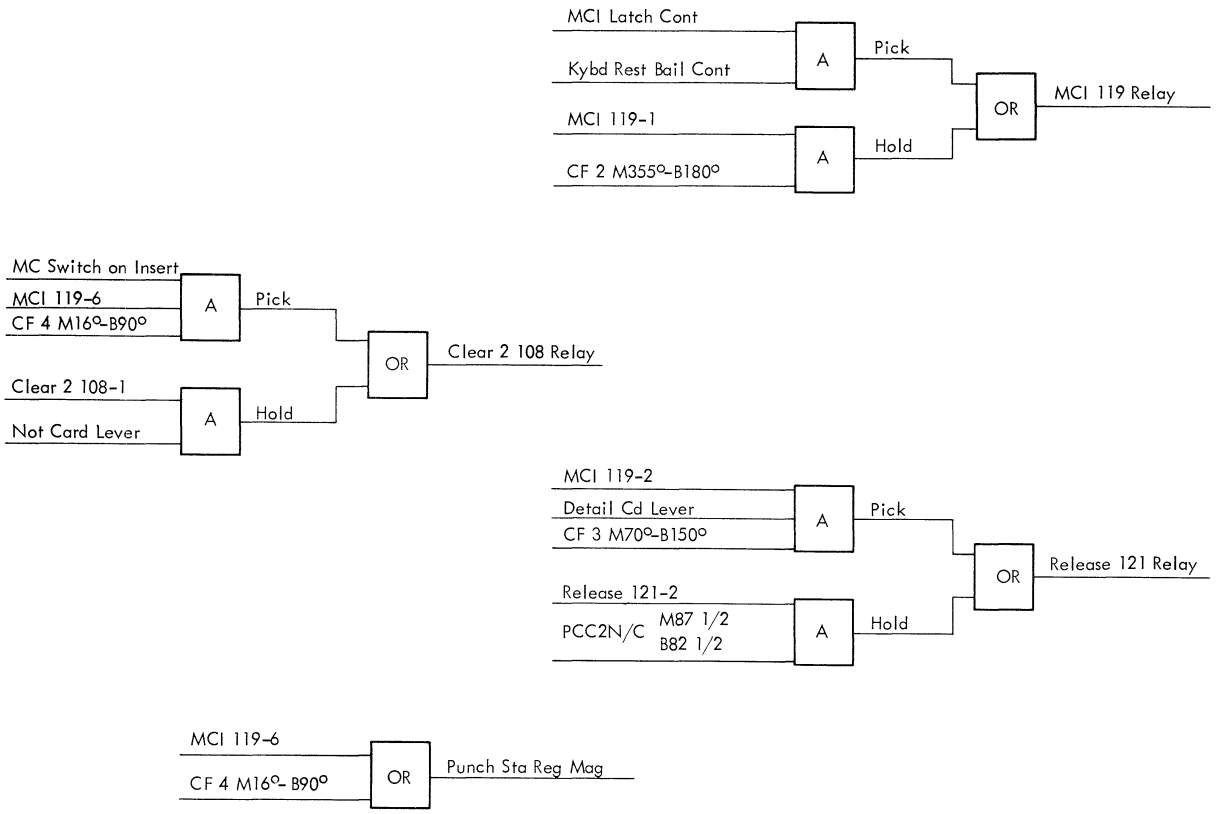


Figure 9-2. Master-Card Insertion Logic (Reed Relay)

3. When the last detail card is completed, the CF latch magnet picks and causes a register cycle instead of a normal feed cycle. With the MC switch on INSERT, the ensuing register cycle causes CF4 to pick clear-2 relay 108.

CF3 makes at 70° to 150° and, with 119-3 N/C picked at this time (relay 119 drops out at 180°), card lever relays 110 and 112 are not picked.

Release relay 121 is picked by CF3 through 119-2 points. Clear-2 relay 108 is being held by the 112-4 N/C points and prevents a feed cycle when PCC2 transfers between column 82½ and 84.

CF4 energizes the punch-station-register magnet at the same time clear-2 relay 108 is picked through 119-6. The punch-station-register magnet prevents the last card in the detail station from registering in the punch station.

4. The card from the punch station was registered in the read station and released to the eject station (prestack position), leaving the read and master stations void of cards.

5. A new master card can now be manually inserted in the master station.

6. Press the feed key to: register both the new master card at the read station and the next detail card at the punch station, and feed a card from the hopper.

7. Normal operation can be resumed. Any fields programmed for duplication are duplicated from the new master card.

Stack Operation

1. Set the insertion switch to STACK. The auto-feed switch must be on.

2. After registering or while punching the last detail card preceding the master card, press the MC key. The MC key must be pressed before column 80 is reached. MCI key latch contact picks MCI relay 119. The 119-4 and 119-5 points transfer PCC2 to the CF latch during a card-to-card skip.

3. When the detail card is completed, the CF latch magnet is energized and, during the card-to-card skip, CF4 energizes the punch-station-register magnet. This suppresses the registering of the last card in the punch station from the detail station.

The MC switch on STACK prevents CF4 from picking the clear-2 relay 108. MCI relay 119 drops out at 180° through 119-1 and CF2. This is too late to pick card lever relays 110 and 112.

PCC2 transfers between column 82½ and 84 and energizes the CF clutch magnet through 119-4 (normal) to initiate a feed cycle. Card lever relays 110 and 112

are picked by CF3 through 119-3 (normal) as the last detail card is released and stacked. The card in the detail station is registered in the punch station, and a new detail card is fed down. There is no card at the read or master station.

4. A new master card can be inserted manually behind the last detail card in the stacker.
5. Normal operation can be resumed.

Circuit Objectives (Reed Relay)

Insert Operation

MC switch on INSERT, auto-feed switch on:

1. Pick MCI relay 119. MCI key latch contact.
2. Initiate a register cycle upon completion of detail card. Energize CF latch magnet. 119-5. PCC2.
3. Pick clear-2 relay 108. MCI switch on INSERT. 119-6. CF4.
4. Pick release relay 121 M2. 119-2. CF3.
5. Prevent picking card lever relays 112 and 110. 119-3 is up (transferred). (CF3 circuit is open.)
6. Hold clear-2 relay 108. 112-4.
7. Prevent a feed cycle when PCC2 transfers. 108-2 N/C, now open, breaks CF clutch magnet circuit.
8. Suppress registering the last card in the punch station. Energize punch station register magnet. 119-6. CF4.
9. Energize card-feed clutch magnet. Feed key latch contact.

Stack Operation

MC switch on STACK, auto-feed switch on:

1. Pick MC relay 119. MCI key latch contact.
2. Initiate a register cycle upon completion of detail card. Energize CF latch magnet. 119-5. PCC2.
3. Energize punch station register magnet. 119-6. CF4 (M16°-B90°).
4. Pick release relay 121 M2. 119-2. CF3 (M70°-B150°).
5. Prevent picking card lever relays 112 and 110. 119-3 is up (transferred). (CF3 circuit is open.)
6. Initiate a feed cycle. Energize CF clutch magnet. 108-2 (normal). 119-4 (normal). MCI relay 119 dropped at 180°. PCC2.
7. During the feed cycle:
   a. The last detail card is released and stacked.
   b. Card lever relays 110 and 112 are picked.
   c. The card in the punch station is registered.
   d. A new card is fed from the hopper.

Description (Wire-Contact Relay)

Wiring diagram part 5405966 replaces parts of sections 5, 7, 8, 9, and 11 of the machine wiring diagram with this feature.

Figure 9-3 shows the conditions that pick or activate the main operating components of the card-insertion feature.

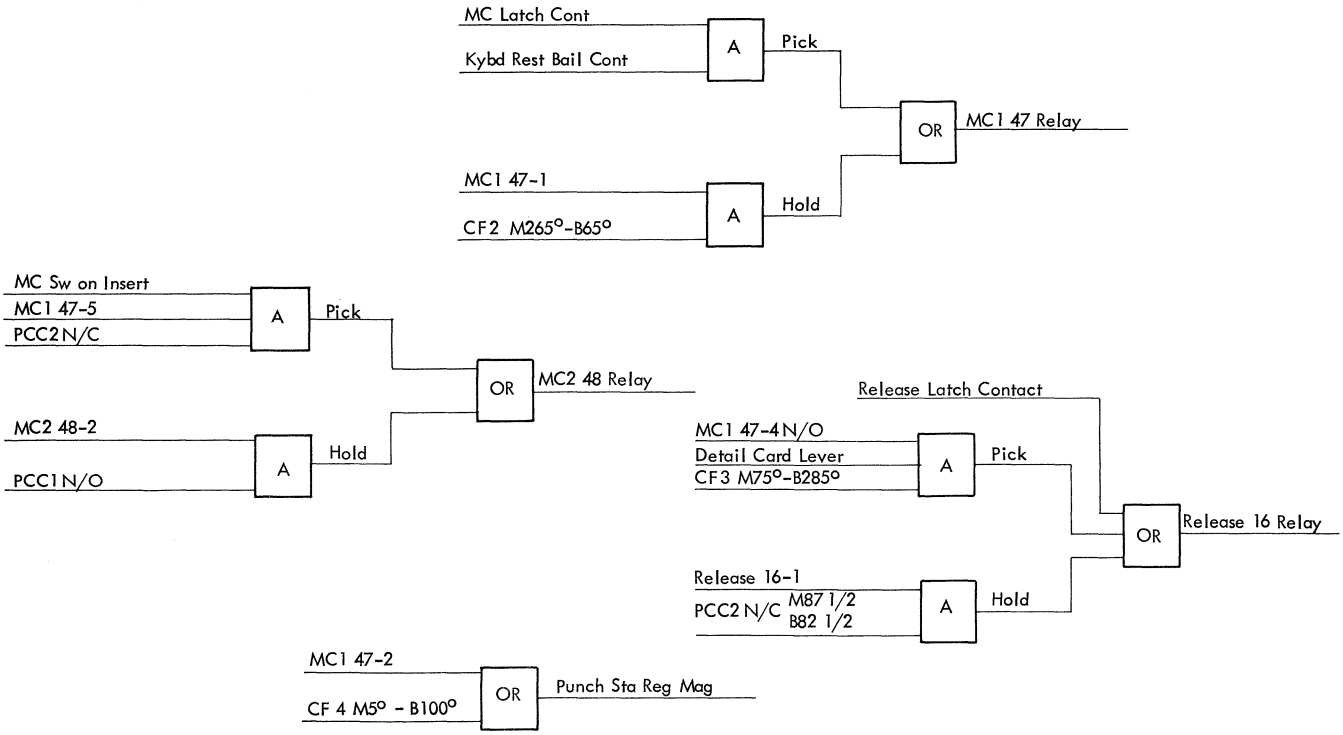


Figure 9-3. Master-Card Insertion Logic (Wire-Contact Relay)

Insert Operation

1. Set the card insertion switch to INSERT. The auto-feed switch must be on.
2. After registering or while punching the last detail card preceding the master card to be inserted, press the MC (master card) key. The MC key must be pressed before column 80 is reached. The MC key latch contact allows CF4 to pick MC1 relay 47 at 5°. The 47-3 points transfer PCC2 N/O to the CF latch magnet during a card-to-card skip.
3. When the last detail card is completed, the CF latch magnet picks and causes a register cycle instead of a normal feed cycle. With the MC switch on INSERT, the ensuing register cycle causes CF3 to pick release relay.

CF3 makes at 75° to 285° and, with 47-4 N/C picked at this time, card lever relay 24 is not picked.

Release relay 16 is picked by CF3 through 47-4 points. MC2 relay 48 is picked through the 47-5 N/O points and PCC2 N/C and prevents a feed cycle when PCC2 transfers between column 82½ and 84.

CF4 energizes the punch-station-register magnet at the same time MC1 relay 47 is picked through 47-2. The punch-station-register magnet prevents the last card in the detail station from registering in the punch station.

4. The card from the punch station was registered in the read station and released to the eject station (prestack position), leaving the read and master stations void of cards.
5. A new master card can now be manually inserted in the master station.
6. Press the feed key to: register both the new master card at the read station and the next detail card at the punch station, and feed a card from the hopper.
7. Normal operation can be resumed. Any fields programmed for duplication are duplicated from the new master card.

Stack Operation

1. Set the insertion switch to STACK. The auto-feed switch must be on.
2. After registering or while punching the last detail card preceding the master card, press the MC key. The MC key must be pressed before column 80 is reached. MC key latch contact picks MC1 relay 47. The 47-3 points transfer PCC2 to the CF latch during a card-to-card skip.
3. When the detail card is completed, the CF latch magnet is energized and, during the card-to-card skip, CF4 energizes the punch-station-register magnet. This suppresses the registering of the last card in the punch station from the detail station.

The MC switch on STACK prevents PCC2 from picking the MC2 relay 48. MC1 relay 47 drops out at 100° through 47-2 and CF2. This is too late to pick card lever relay 24.

PCC2 transfers between column 82½ and 84 and energizes the CF clutch magnet through 47-4 N/C to initiate a feed cycle. Card lever relay 24 is picked by CF3 through 47-4 N/C as the last detail card is released and stacked. The card in the detail station is registered in the punch station, and a new detail card is fed down. There is no card at the read or master station.

4. A new master card can be inserted manually behind the last detail card in the stacker.
5. Normal operation can be resumed.

Circuit Objectives (Wire-Contact Relay)

Insert Operation

MC switch on INSERT, auto-feed switch on:

1. Pick MC1 relay 47. MC key latch contact.
2. Initiate a register cycle upon completion of detail card. Energize CF latch magnet. 47-3. PCC2.
3. Pick release relay 16. MC1 switch on INSERT. 47-4. CF3.
4. Pick MC2 relay 48. 47-5. PCC2 N/C.
5. Prevent picking card lever relay 24. 48-3 is transferred. CF3 circuit is open.
6. Hold MC2 relay 48. 48-2. PCC1.
7. Prevent a feed cycle when PCC2 transfers. 48-4 N/C, now open, breaks CF clutch magnet circuit.
8. Suppress registering the last card in the punch station. Energize punch station register magnet. 47-2. CF4.
9. Energize card-feed clutch magnet. Feed key latch contact.

Stack Operation

MC switch on STACK, auto-feed switch on:

1. Pick MC1 relay 47. MC key latch contact.
2. Initiate a register cycle upon completion of detail card. Energize CF latch magnet. 47-3. PCC2.
3. Energize punch station register magnet. 47-2. CF4 (M5°-B100°).
4. Pick release relay 16. 47-4. CF3 (M75°-285°).
5. Prevent picking card lever relay 24. 47-4 is transferred. CF3 circuit is open.
6. Initiate a feed cycle. Energize CF clutch magnet. 47-3 N/C. MC1 relay 47 dropped at 100°. PCC2.
7. During the feed cycle:
   a. The last detail card is released and stacked.
   b. Card lever relay 24 is picked.
   c. The card in the punch station is registered.
   d. A new card is fed from the hopper.

Maintenance

Adjustment

Adjust the punch station registration magnet so that the armature block just clears the latch on the pusher-arm shaft when the latch is in the forward or operated position, but will block the latch when the magnet is energized.

Chapter 10. Self-Checking Number Feature, Modulus 10

Theory of Operation

- **The feature has two modes of operation: check and punch.**
- **In check mode, the feature detects errors in the programmed self-checking field by the time the end of the field is reached.**
- **In punch mode, the feature computes and punches the check digit in the units position of the self-checking field.**
- **A single check digit, determined by the numerical value of the basic number, is added to the basic number to form the self-checking number.**

Self-Checking Number, Modulus 10, is available on the IBM 29 Model A only. It is compatible with all special features except self-checking number, modulus 11.

This feature makes it unnecessary to verify certain information punched on the IBM 29 Card Punch. *Basic numbers* (example: part numbers, order numbers, or account numbers) can be punched and, by the time the end of the field is reached, be automatically checked for accuracy of punching or validity.

The modulus 10 self-checking system is based upon computing a single *check digit* and adding it to the basic number. The check digit is determined by the value of the basic number to be checked, and is placed to the right of the basic number; together they make up the *self-checking number*. For example, for the number 34628, the check digit is 8, so the resulting self-checking number is 346288.

The program card switches the machine to self-check mode and defines the factors (×1 and ×2) used in the process of computing the check digit.

A toggle switch located on the keyboard has two positions: punch and check. With the switch at PUNCH, the operator keys in the basic number, and the machine automatically calculates and punches the check digit. With the switch at CHECK, the operator keys in the basic number plus the check digit, and the machine automatically verifies the self-checking field.

Calculation of the Check Digit

Using 34628 as a sample basic number, a manual method of computing the check digit is as follows:

1. Start with the low-order position of the basic number and multiply the first, the third, and every odd-numbered-order digit (every other digit) by two. Multiply the other digits by one:

Basic Number	3	4	6	2	8
Factors	×2	×1	×2	×1	×2
Product	6	4	12	2	16

2. Add all digits of the product (crossfoot):
   $6 + 4 + 1 + 2 + 2 + 1 + 6 = 22$
3. Subtract the crossfooted total from the next highest number ending in zero.

$$\begin{array}{rr} & 30 \\ - & 22 \\ \hline \text{Check Digit} & 8 \end{array}$$

4. Place the check digit (8) adjacent to, and to the right of, the basic number:
   346288
5. The self-checking number of 34628 is 346288.

Other examples:

BASIC NUMBER	CHECK DIGIT	SELF-CHECKING NUMBER
45626	9	456269
30759	5	307595
73074	7	730747

Program Card

- **Preparation of the program card depends on the size of the self-checking field.**
- **Check and punch modes are programmed the same way.**
- **The 2 and 3 program contacts (program 1) and the 8 and 9 program contacts (program 2) are used to define the self-checking factors (×1 and ×2).**
- **Field definition (12 or 4) is punched in all columns of the field (except the high-order column) to increase release speed, skip, or duplicate.**
- **Self-checking fields must be separated by at least one column; the program card is punched normally for all other punch operations.**

Program 1

If the self-checking field in the detail card has an odd number of columns (3, 5, 7, etc.), punch a 2 in the first column of the field in the program card. Punch 12-3 in the second column, 12-2 in the third column, 12-3 in the fourth column, and so on to the last column

of the self-checking field. The last column of the field (check-digit position) must be punched 12-2-3.

If the field has an even number of columns (2, 4, 6, etc.), punch a 3 in the first column of the field in the program card, punch 12-2 in the second column, 12-3 in the third column, 12-2 in the fourth column, and so on, up to the last column of the field. The last column of the field (check-digit position) must be punched 12-2-3.

Program 2

If the self-checking field of the detail card has an odd number of columns (3, 5, 7, etc.), punch an 8 in the first column of the field in the program card. Punch 4-9 in the second column, 4-8 in the third column, 4-9 in the fourth column, and so on up to the last column of the self-checking field. The last column of the field (check-digit position) must be punched 4-8-9.

If the field has an even number of columns (2, 4, 6, etc.), punch a 9 in the first column of the field in the program card, punch 4-8 in the second column, 4-9 in the third column, 4-8 in the fourth column, and so on, up to the last column of the field. The last column of the field (check-digit position) must be punched 4-8-9.

Operating Procedure, Check Mode

- **Numbers to be checked can be keyed manually, or automatically duplicated under program control.**
- **An 11 is automatically punched in column 81 on cards with no self-checking field errors.**
- **A 12 is automatically punched over the check digit column in a self-checking field that is incorrect.**

Self-checking numbers are recorded on source documents by coding clerks or they are punched into data cards.

With the field defined in the program card and the switch on CHECK, the self-checking number (in our example, 346288) is keypunched as it appears on the source document. Internal calculations will verify the accuracy of the keying or validity of the number to be checked, and if no errors are detected, the punching operation is not interrupted. If no errors are detected throughout the punching of self-checking fields in the card, the 11-position (OK punch) is automatically punched in column 81. (On machines equipped with a variable-length feed device and on those processing short cards, the OK punch will appear in column 52, 61, or 67, depending on card length.)

If the check digit is recorded on the source document incorrectly (example: 346289 instead of 346288), or if any digit of the base number is punched incorrectly (example: 446288 instead of 346288), the error condition is signaled by a red light on the keyboard when the check digit is punched. A 12 is automatically punched over the check-digit column and the keyboard is locked. To release the error card and restore the keyboard, the error-reset key is pressed. If an error occurs, the keyboard is held restored to prevent further information from being keyed. Whenever such an error occurs, the 11-punch in column 81 is suppressed.

The correctly punched fields of the error card can then be duplicated into a new card up to the self-checking field in error. The self-checking field is then repunched. If it is punched as recorded on the source document and the keyboard locks again, it indicates that an incorrect number appears on the source document or the check digit is incorrect.

A self-checking number can include letters and spaces, but only the numbers (0-9) and the digit portion of the letters (1-9) will be checked. Special characters cannot be checked. Letters, spaces, and zero-punched columns can intervene only if they were considered part of the basic number when the check digit was established. The check digit must be keyed immediately following the units position of the basic number.

More than one self-checking field can be programmed on the same card but two self-checking fields must be separated by at least one card column. All self-checking fields must be correctly punched to obtain the column 81 OK punch.

When more than one self-checking field is programmed, the successful keying of any *one* field can produce an 81X if the other fields are skipped or bypassed by a change in program level.

The appearance of an 81X signifies that all self-checking fields that are *punched* in the card are correct, whether keyed or duplicated. Skipping or bypassing an entire self-checking field is a valid operation.

Operating Procedure, Punch Mode

- **Operation in punch mode gives a self-checking number that can be used for later verification.**

With the switch in the PUNCH position, the operator keys only the basic number. Machine circuitry computes the check digit as it does in check mode, but instead of the operator keying the check digit, the machine automatically punches the check digit immediately after the basic number is punched. The check digit becomes the units position of a self-checking number that can be used later in check mode for punching verification.

Duplication

Duplication of a self-checking field should not be attempted if the number contains one or more spaces. The keyboard will lock. Under these conditions, the release key is inoperative and the error-reset key will not unlock the keyboard. Pressing the alpha shift key will permit the operator to get past the blank columns; however, the check-digit calculation will be incorrect. Remake the card by manually keying the self-checking number that contained spaces.

Duplication of a self-checking number that has one or more columns programmed for alphabetic is possible if the columns so designated contain letters and *not* spaces.

In the manual keying of a self-checking field, the alpha shift key can be used when entering an alphabetic character. This type of self-checking field should not be duplicated.

Duplication of a self-checking number field, or part of the field, is possible, but must be initiated in the high-order position of the field. Duplication may be initiated by a zero punch in the program card (high-order position) or by pressing the DUP key. In either case, the portion of the field to be duplicated *must* be defined by 12-punches in the program card (except over the first column of the field). If duplication is initiated at some point after the high-order position of the self-checking field, an error will result.

Operating Information

- **The self-checking number and the self-checking field must be equal in number of digits.**
- **Left-aligned numbers cannot be checked.**
- **An 11 in column 81 is not punched when a release follows a checked correct field.**
- **Manual skipping or duplication can be initiated only in the first column of a self-checking field.**

Although a field to be self-checked may be of any length (up to 79 columns plus the check digit), once the predetermined field length has been programmed for self-checking, all numbers to be self-checked *must* contain the same number of digits as the programmed self-checking field. The check digit *must* always occupy the last right position of the self-checking number field. The modulus 10 technique of self-checking is not valid with left-aligned (left case) numbers.

More than one self-checking field may be checked per card. Self-checking fields must be separated by at least one card column. When the first self-checking field with an error is detected, a 12 is punched over the units position of the erroneous self-checking field. The card is released by pressing the error-reset key.

If the remainder of the card is to be skipped from any point after the end of a self-checking field, skipping can be initiated by program control or the skip key. Skipping can be initiated by pressing the skip key only when in the high-order position of the self-checking field. A field-2 relay point breaks the skip circuit and prevents skipping from being initiated after the high-order position of the field. The field-2 relay is picked after the first key is pressed in a self-checking number field. If the release key is used for this skipping, the X in column 81 is not punched, even though the self-checking field is correct.

In the first column of a self-checking field, one of the following operations can be performed:

1. The field can be manually keyed and the validity of the number is checked by the arithmetic circuits.
2. When the self-checking field has no spaces, and has field definition, the entire field can be duplicated and checked by use of the manual dup key.
3. The entire field can be manually skipped without calculation.
4. A shift in program level can bypass the entire field.

Once keying of the self-checking field has started, the manual dup, manual skip, program-1, and program-2 keys are all inoperative.

The release key is not inhibited unless a checking error has been indicated. The release can be used in a self-checking field if the operator has miskeyed and wishes to make over the card.

Functional Units

- **The self-checking feature consists of an adder matrix (wiring diagram sections 21 and 22 for reed-relay machines or 15 and 16 for wire-contact relay machines) and a multiplier matrix (wiring diagram sections 19 and 20 for reed-relay machines or 13 and 14 for wire-contact relay machines) of relay points.**
- **The multiplier matrix is controlled by starwheel sensing of the program card.**
- **The adder matrix is controlled by the sum of digits punched, less carries.**
- **Binary relay storage is used for the sum of the addition.**

External changes to the basic IBM 29 are:

1. An error light on the left side of the keyboard switch plate.
2. A toggle switch (CHK/PUNCH) on the keyboard switch plate.

Basic card-punch circuitry is virtually unchanged. This circuitry and the additional modulus 10 circuitry operate entirely in 48v relay logic. The modulus 10

circuitry on reed-relay machines uses wire-contact relays. These relays are mounted on a feature gate inserted in the rear position of the relay gate slide assembly (behind the reed relay circuit card). Three paddle cards (3A, 3B, and 3C) connect the self-checking feature to the machine circuits. The paddle-card connections are designated in the same manner as the reed relay circuit card tabs. Figure 10-1 is a rear view of the reed-relay machine with the self-check gate assembly extended in the servicing position. Figure 10-2 shows the circuitry in the wire-contact relay machine. Ease of servicing the feature is increased by an orderly design of relay points in the matrices. The relay points assigned to each signal path correspond to the digit value.

The primary circuits of the feature consist of a single-character, base-10 multiplier matrix and a single-character, base-10 adder matrix. The multiplier matrix is a series of relay points controlled according to the assigned factor for the digit position in the program card. The input to this matrix is the same impulse that is sent to the punch magnet. The output is the punched digit value multiplied by the assigned factor. The matrix does not contain circuitry to retain carries, and carries are purposely lost. This is done by adding the carry to the units position of the product ($8 \times 2 = 7$).

The adder matrix is a series of relay points controlled according to the accumulated total of previous digits punched. The input to this matrix is the output of the multiplier matrix. The output is the sum of the previously punched digits, plus the multiplier matrix output. The adder matrix does not contain circuitry to retain carries, and carries are purposely lost.

The binary-coded relays retain the single-digit result of the addition. These relays are assigned the values 1, 2, 4, and 8. The digit value to be retained is determined by the sum of values of the relays picked.

The program card defines the assigned self-checking factors ($\times 1$ and $\times 2$) and the field length. Program sensing contacts for positions 3 and 9 pick multiplier relay $\times 2$. The 2, 3, 8, and 9 contact signals also pick the field-1 relay to define a self-checking number field. The 12 and 4 contacts are added only to increase release speed, skip, or duplicate during the operation.

The check-digit position of the self-checking number is defined by a multipunched (2 and 3 *or* 8 and 9) column in the program card. The check digit is added to the accumulated sum and should result in a zero balance.

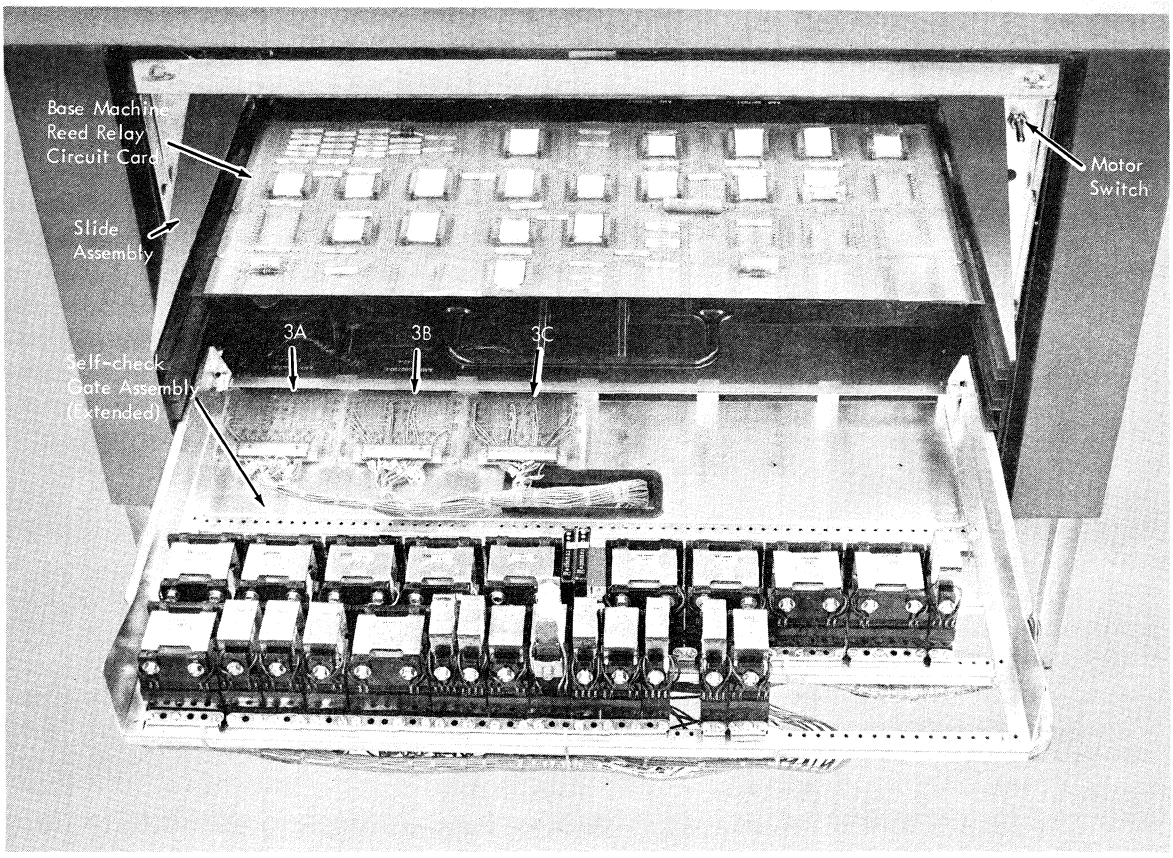


Figure 10-1. Reed-Relay Gate (Modulus 10)

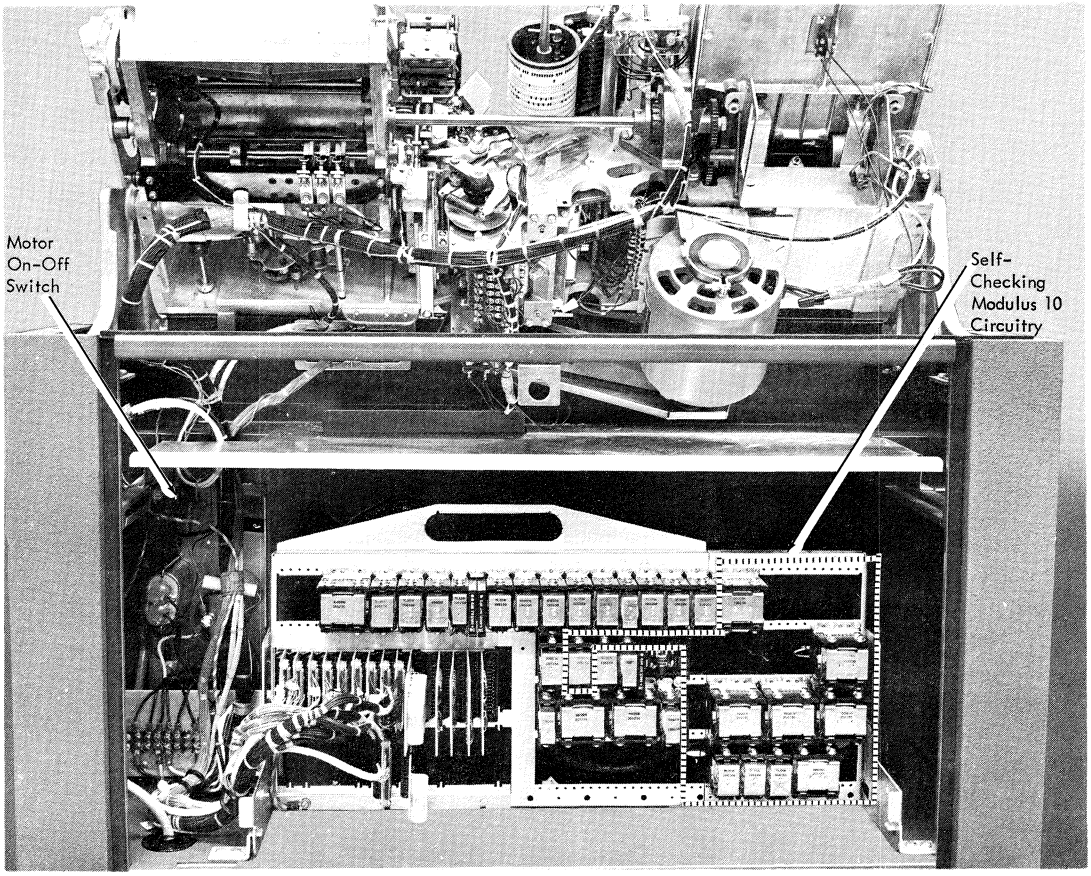


Figure 10-2. Wire-Contact Relay Gate (Modulus 10)

Principles of Operation

- The self-checking factors are defined by the card on the program drum.
- Multiplier output is the product of the digit multiplied by the checking factor.
- Multiplier output is added to the previous product sum in the adder matrix.
- The adder relays hold the accumulated product totals.
- The check digit, when added to the sum in the adder relays, produces a sum of 10 in the transfer relays (T8 and T2), which causes an OK relay to be picked (in check mode).
- Values left in the transfer relays, other than zero, cause the error relay and the 12-interposer punch magnet to be picked (in check mode).

Check Mode

- The operator keys the self-checking numbers at the keyboard.
- The machine verifies the accuracy of the self-checking number when the check digit is keyed.

Follow the logic in Figure 10-3. Program sensing contacts 3 or 9 (prepunched in the self-checking field of the program card) pick multiplier relay ×2; the transferred X-relay-points in the multiplier cause the digit value from the keyboard to be multiplied by two (×2) for that digit position. The resulting output of the multiplier is the product of the digit value, times the checking factor for that column. Program sensing contacts 2 or 8 cause the digit value from the keyboard to be multiplied by one (×1) for that digit position.

The output of the multiplier is entered in the adder relay matrix. The product sum from the previous operation is added to the multiplier output. The transfer relays store the new product sum. The transfer relays send the new sum to the adder relays. At the completion of each column of operation, the adder relays contain the accumulated product total of digit values multiplied by the weighted checking factors.

The right-hand portion of Figure 10-3 contains the logic needed for the check-digit column. At this point, punch the check digit to verify its preceding basic number. The multipunched 2 and 3 (program 1) or 8 and 9 (program 2) in the program card identifies the check-digit column. This program combination

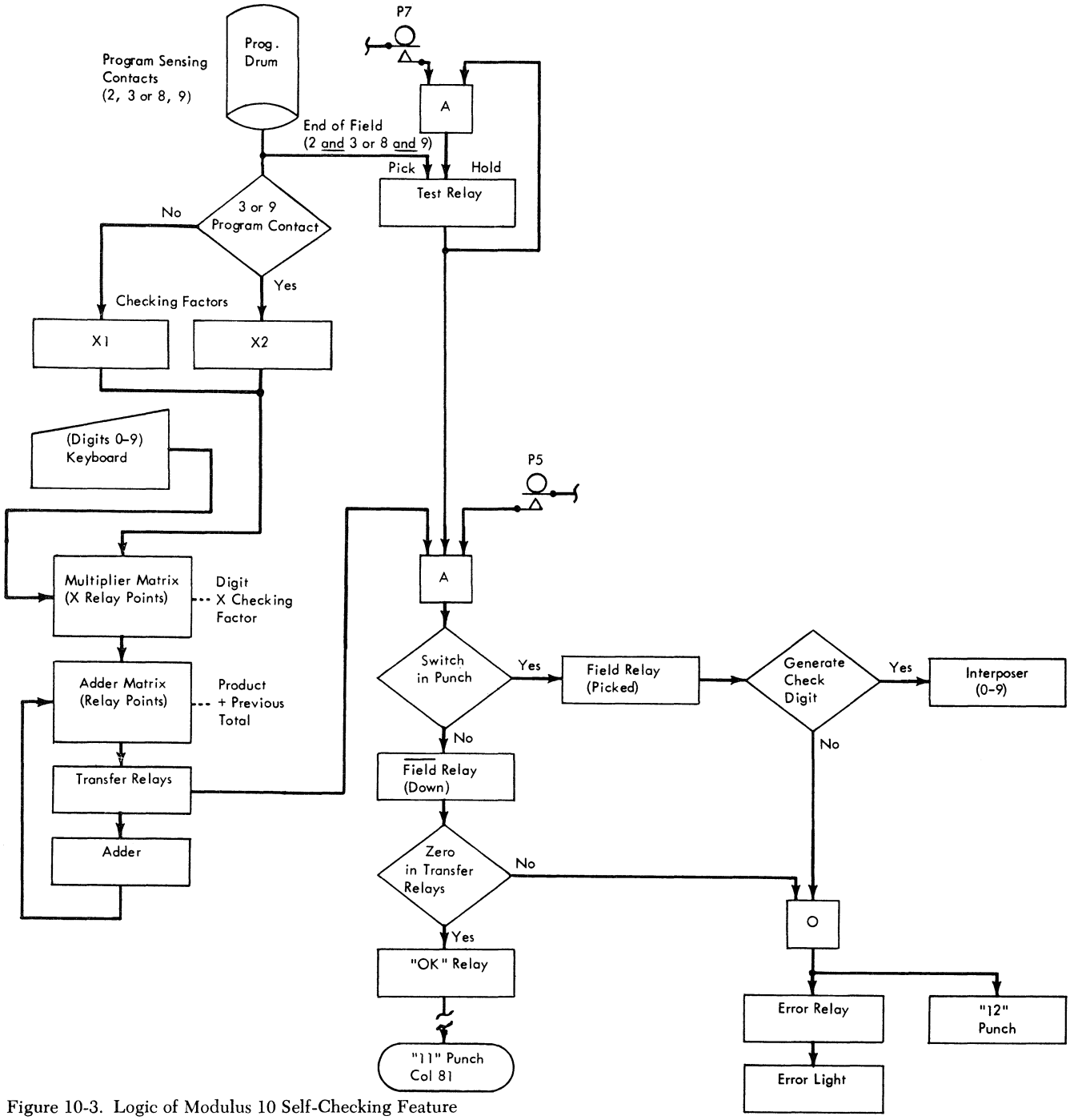


Figure 10-3. Logic of Modulus 10 Self-Checking Feature

activates the test circuit. When the operator keys the check-digit value, the value is multiplied by one and is added to the total in the adder relays. The result in the transfer relays conditions the test circuit. If the final sum in the transfer relays is 10 (T8 and T2) an OK relay is picked. If the transfer relays contain any result other than 10, the error relay, error light, and 12-interposer punch magnet are picked. The keyboard is held restored and the error-reset key must be pressed to unlock the machine and release the error card.

An example of the machine self-checking arithmetic operation is shown in Figure 10-4.

Check Mode: Sequence of Events

Figure 10-5 shows the sequence of events when the operator punches the two low-order positions of a self-checking number (the units position of the basic number and the check digit). The events outlined in blocks 1-5 occur at each column of the self-checking field. Blocks 6 and 7 occur only when the check-digit position is sensed.

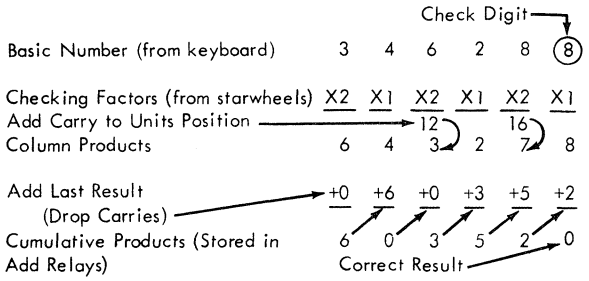


Figure 10-4. Self-Checking Arithmetic

Check Mode: Circuit Objectives (Reed Relay)

The ACTION column does not necessarily mean active operations by an operator. It contains circuit initiators such as contacts closed by keys, cams, and relays. The RESULT column gives the effect of the action on the circuit.

To check a self-checking number: Prepare the program card as shown in Figure 10-6. With the self-check switch at CHECK, feed and register a card at the punch station and enter the self-checking number (346288).

CF4 picks XFER INT during the card feed cycle.

Column 1

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
3-key pressed	Pick-3 interposer, T4, T2
P2 (N/C) (M-149°)	Hold T4, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T4, T2	Pick A4, A2, FLD 2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A2	Hold A4, A2
P2 (B-79°)	Drop T4, T2
P5 (M-86°)	Pick XFER INT

Final result: 6 stored in add relays (A4, A2).

Column 2

ACTION	RESULT
2-program contact	Pick FLD 1
4-key pressed	Pick 4-interposer, T8, T2
P2 (N/C) (M-149°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T8, T2	Pick A8, A2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A8, A2	Hold A8, A2
P2 (B-79°)	Drop T8, T2
P5 (M-86°)	Pick XFER INT

Final result: 0 stored in add relays (A8, A2).

Column 3

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
6-key pressed	Pick 6-interposer, T2, T1
P2 (N/C) (M-149°)	Hold T2, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T2, T1	Pick A2, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2, A1	Hold A2, A1
P2 (B-79°)	Drop T2, T1
P5 (M-86°)	Pick XFER INT

Final result: 3 stored in add relays (A2, A1).

Column 4

ACTION	RESULT
2-program contact	Pick FLD 1
2-key pressed	Pick 2-interposer, T4, T1
P2 (N/C) (M-149°)	Hold T4, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T4, T1	Pick A4, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A1	Hold A4, A1
P2 (B-79°)	Drop T4, T1
P5 (M-86°)	Pick XFER INT

Final result: 5 stored in add relays (A4, A1).

Column 5

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
8-key pressed	Pick 8-interposer, T2
P2 (N/C) (M-149°)	Hold T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T2	Pick A2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2	Hold A2
P2 (B-79°)	Drop T2
P5 (M-86°)	Pick XFER INT

Final result: 2 stored in add relays (A2).

Column 6 (Last column of field; check digit)

ACTION	RESULT
2 & 3 program contact	Pick TEST
8-key pressed	Pick 8-interposer, T8, T2
P2 (N/C) (M-149°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T8, T2	Pick A8, A2
3-program contact breaks	Drop FLD 1, FLD 2
P7 (M-241°)	Hold TEST, T8, T2
P6 (M-53°), A8, A2	Hold A8, A2
P5 (M-86°), TEST, FLD 1 (N/C)	Pick OK
P7 (B-166°)	Drop T8, T2. Hold OK until following test position or column 81

Final result: 0 stored in add relays (A8, A2).

Column 81

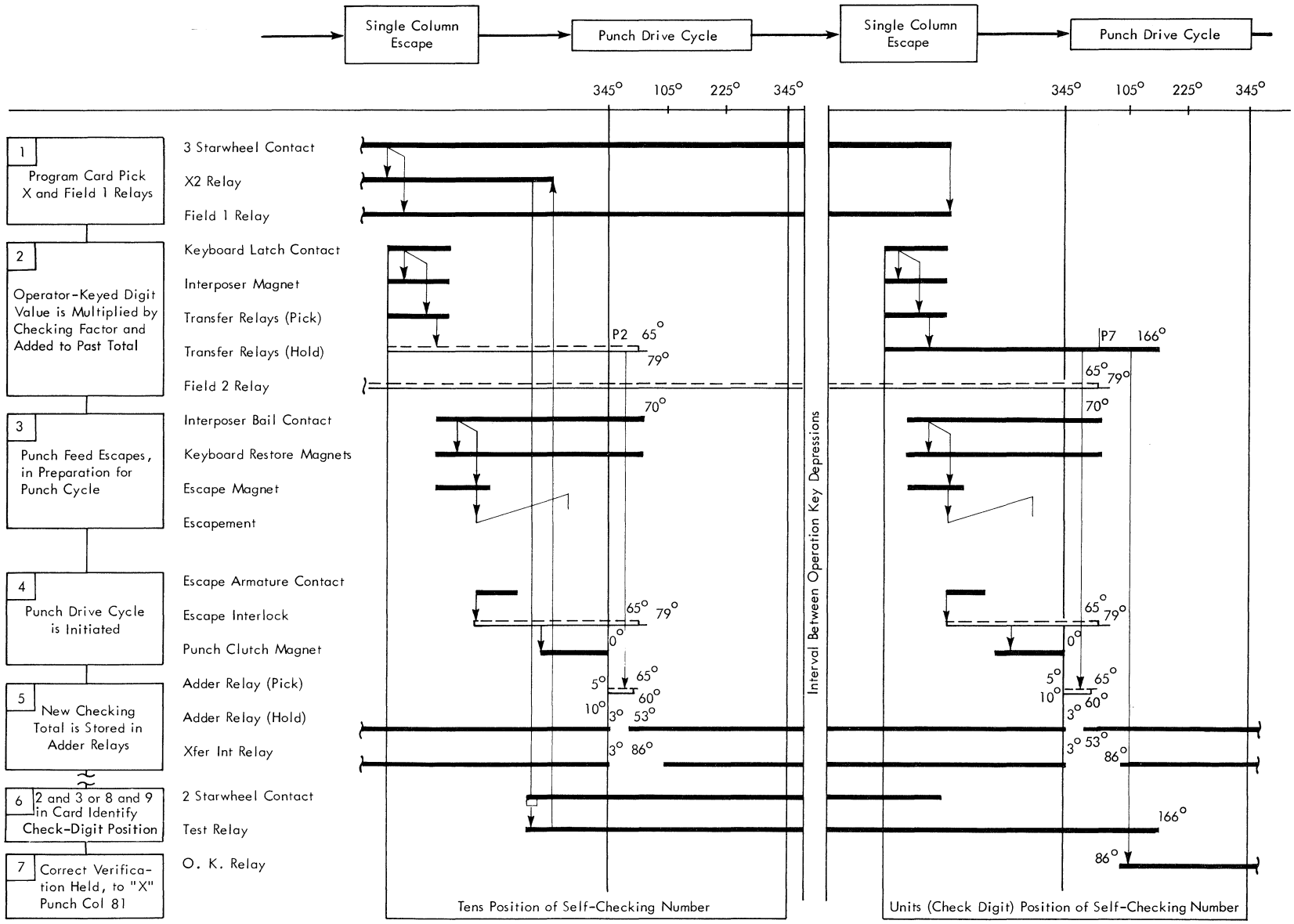
ACTION	RESULT
PCC1, OK	Pick 11-interposer

Check Mode: Error Condition (Reed Relay)

Substitute a 6-key entry in the check-digit position of the preceding example (punch 346286).

Columns 1 through 5

ACTION	RESULT
Same as preceding example (correct condition)	2 stored in add relays (A2)



Note: Where timings differ, dashed line indicates wire-contact relay machine timing; solid line indicates reed-relay machine timing.

Figure 10-5. Sequence (Self-Checking the Tens and Units Positions of a Number)

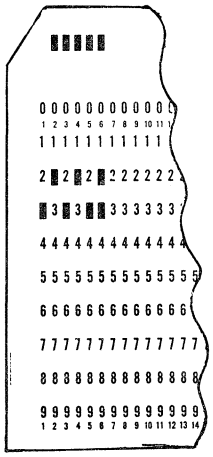


Figure 10-6. Self-Checking Field Defined by Program Card (Program Level 1)

Column 6

ACTION	RESULT
2 & 3 program contact	Pick TEST
P7 (M-241°)	Hold TEST
6-key pressed	Pick 6-interposer, T8
P2 (N/C) (M-149°)	Hold T8
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T8	Pick A8
3-program contact breaks	Drop FLD 1, FLD 2
P7 (M-241°)	Hold TEST, T8
P6 (M-53°), A8	Hold A8
P2 (B-79°)	Drop T8
P5 (M-86°), TEST, FLD 1 (N/C)	Pick ERROR and 12-interposer
	Pick MULTI-PUNCH and RELEASE
MULTI-PUNCH	Block escapement and punch 12 over units position
Error-reset key pressed	Reset ERROR and release

Check Mode: Circuit Objectives (Wire-Contact Relay)

The ACTION column does not necessarily mean active operations by an operator. It contains circuit initiators such as contacts closed by keys, cams, and relays. The RESULT column gives the effect of the action on the circuit.

To check a self-checking number: Prepare the program card as shown in Figure 10-6. With the self-check switch at CHECK, feed and register a card at the punch station and enter the self-checking number (346288).

Card lever picks XFER INT during the card feed cycle.

Column 1

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
3-key pressed	Pick-3 interposer, T4, T2
P2 (N/C) (M-135°)	Hold T4, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T4, T2	Pick A4, A2, FLD 2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A2	Hold A4, A2
P2 (B-65°)	Drop T4, T2
P5 (M-86°)	Pick XFER INT

Final result: 6 stored in add relays (A4, A2).

Column 2

ACTION	RESULT
2-program contact	Pick FLD 1
4-key pressed	Pick 4-interposer, T8, T2
P2 (N/C) (M-135°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T8, T2	Pick A8, A2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A8, A2	Hold A8, A2
P2 (B-65°)	Drop T8, T2
P5 (M-86°)	Pick XFER INT

Final result: 0 stored in add relays (A8, A2).

Column 3

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
6-key pressed	Pick 6-interposer, T2, T1
P2 (N/C) (M-135°)	Hold T2, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T2, T1	Pick A2, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2, A1	Hold A2, A1
P2 (B-65°)	Drop T2, T1
P5 (M-86°)	Pick XFER INT

Final result: 3 stored in add relays (A2, A1).

Column 4

ACTION	RESULT
2-program contact	Pick FLD 1
2-key pressed	Pick 2-interposer, T4, T1
P2 (N/C) (M-135°)	Hold T4, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T4, T1	Pick A4, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A1	Hold A4, A1
P2 (B-65°)	Drop T4, T1
P5 (M-86°)	Pick XFER INT

Final result: 5 stored in add relays (A4, A1).

Column 5

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
8-key pressed	Pick 8-interposer, T2
P2 (N/C) (M-135°)	Hold T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T2	Pick A2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2	Hold A2
P2 (B-65°)	Drop T2
P5 (M-86°)	Pick XFER INT

Final result: 2 stored in add relays (A2).

Column 6 (Last column of field; check digit)

ACTION	RESULT
2 & 3 program contact	Pick TEST
8-key pressed	Pick 8-interposer, T8, T2
P2 (N/C) (M-135°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch

P6 (B-3°)	Drop XFER INT
P3 (M-5°), T8, T2	Pick A8, A2
3-program contact breaks	Drop FLD 1, FLD 2
P7 (M-241°)	Hold TEST, T8, T2
P6 (M-53°), A8, A2	Hold A8, A2
P5 (M-86°), TEST, FLD 1 (N/C)	Pick OK
P7 (B-166°)	Drop T8, T2. Hold OK until following test position or column 81

Final result: 0 stored in add relays (A8, A2).

Column 81

ACTION	RESULT
PCC1, OK	Pick 11-interposer

Check Mode Circuits: Error Condition (Wire-Contact Relay)

Substitute a 6-key entry in the check-digit position of the preceding example (punch 346286).

Columns 1 through 5

ACTION	RESULT
Same as preceding example (correct condition)	2 stored in add relays (A2)

Column 6

ACTION	RESULT
2 & 3 program contact	Pick TEST
P7 (M-241°)	Hold TEST
6-key pressed	Pick 6-interposer, T8
P2 (N/C) (M-135°)	Hold T8
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T8	Pick A8
3-program contact breaks	Drop FLD 1, FLD 2
P7 (M-241°)	Hold TEST, T8
P6 (M-53°), A8	Hold A8
P2 (B-65°)	Drop T8
P5 (M-86°), TEST, FLD 1 (N/C)	Pick ERROR and 12-interposer
	Pick MULTI-PUNCH and RELEASE
MULTI-PUNCH	Block escapement and punch 12 over units position
Error-reset key pressed	Reset ERROR and release

Punch Mode

- **The operator keys only the basic number.**
- **This is not a verification (checking) operation.**
- **The machine computes and generates a pulse that automatically punches the check digit in the units position of the self-checking number field.**

With the switch in the PUNCH position, the operation is the same as in the check position, except that the generate relay is held continuously (no 81 x punch).

Punch Mode: Sequence of Events

Figure 10-7 shows the sequence of events when the operator keys the low-order position of the basic number.

The check-digit impulse is generated during the punch cycle for the units position of the basic number. Points of the generate relay switch the pulse from P5 through a combination of transfer relay points as determined by the value present in the transfer relays. The resulting output from one of the transfer relay points energizes the interposer magnet for the correct check-digit value. Another escape and punch cycle is taken to punch the check-digit value into the next column. Note that the check digit is a tens complement of the value of the transfer relays. For example, if T4 and T2 are up, a check digit of 4 is punched.

A generated check digit of 0 is indicated if T8 and T2 transfer relays are up when the check-digit position is reached. In this case, the check-digit impulse picks the zero interposer punch magnet. A generated check digit greater than nine (a machine malfunction) energizes the error relay. The error light comes on, a 12 is punched, and the machine locks up. Press ERROR RESET to restore the machine and release the error card.

Punch Mode: Circuit Objectives (Reed Relay)

To develop a self-checking number, by calculating and punching a check digit from a basic number: Prepare the program card as shown in Figure 10-6. Feed and register a card at the punch station. The basic number to be entered is 34628.

CF4 picks XFER INT during a card-feed cycle.

Column 1

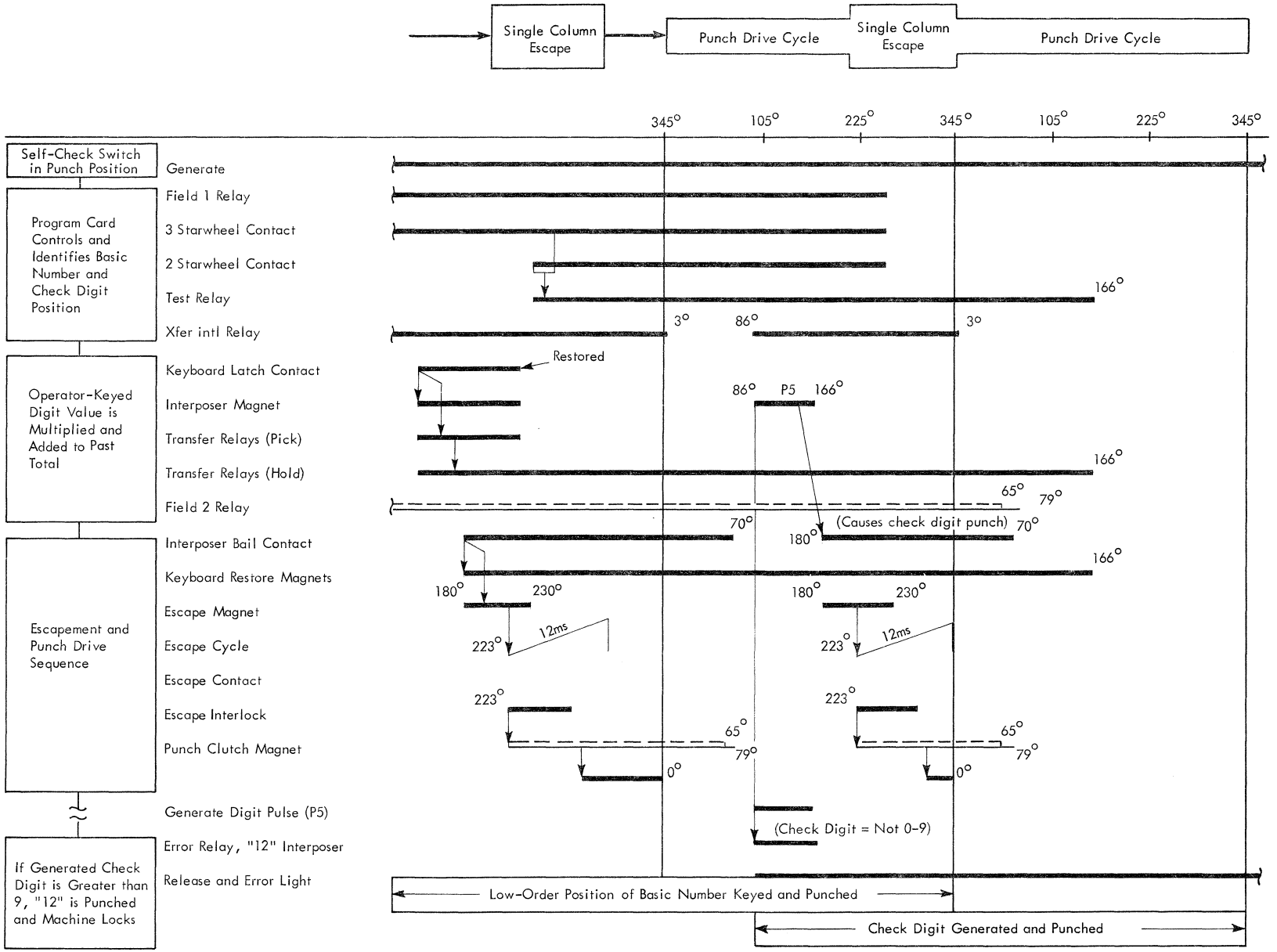
ACTION	RESULT
Switch in punch	Pick GEN
3-program contact	Pick ×2, FLD 1
3-key pressed	Pick 3-interposer, T4, T2
P2 (N/C) (M-149°)	Hold T4, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T4, T2	Pick A4, A2, FLD 2
FLD 2, +48V	Hold FLD 2
P6 (M-53°), A4, A2	Hold A4, A2
P2 (B-79°)	Drop T4, T2
P5 (M-86°)	Pick XFER INT

Final result: 6 stored in add relays (A4, A2).

Column 2

ACTION	RESULT
2-program contact	Pick FLD 1
4-key pressed	Pick 4-interposer, T8, T2
P2 (N/C) (M-149°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T8, T2	Pick A8, A2
FLD 2, +48V	Hold FLD 2
P6 (M-53°), A8, A2	Hold A8, A2
P2 (B-79°)	Drop T8, T2
P5 (M-86°)	Pick XFER INT

Final result: 0 stored in add relays (A8, A2).



Note: Where timings differ, dashed line indicates wire-contact relay timing; solid line indicates reed-relay timing.

Figure 10-7. Sequence (Generating the Check Digit in Punch Mode)

Column 3

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
6-key pressed	Pick 6-interposer, T2, T1
P2 (N/C) (M-149°)	Hold T2, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T2, T1	Pick A2, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2, A1	Hold A2, A1
P2 (B-79°)	Drop T2, T1
P5 (M-86°)	Pick XFER INT

Final result: 3 stored in add relays (A2, A1).

Column 4

ACTION	RESULT
2-program contact	Pick FLD 1
2-key pressed	Pick 2-interposer. T4, T1
P2 (N/C) (M-149°)	Hold T4, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-10°), T2, T1	Pick A4, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A1	Hold A4, A1
P2 (B-79°)	Drop T4, T1
P5 (M-86°)	Pick XFER INT

Final result: 5 stored in add relays (A4, A1).

Column 5

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
8-key pressed	Pick 8-interposer, T2
Interposer bail contact	Escape magnet (180°-230°)
Escape armature contact	Escape interlock and punch clutch

Final result: T2 picked, punch an 8 in column 5, escape to column 6.

Column 6

ACTION	RESULT
2 and 3 program contact	Pick TEST
P2 (M-149°), FLD 1, FLD 2	Hold T2
P7 (M-241°), TEST, GEN	Hold TEST
TEST, GEN	Prevent picking A2
P5 (M-86°), TEST, FLD 1 (N/O), GEN, T2	Pick 8-interposer
TEST, GEN	Prevent picking transfer and add relays
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock; punch column 6, escape to column 7

Final result: Nothing stored in add relays.

Punch Mode: Circuit Objectives (Wire-Contact Relay)

To develop a self-checking number, by calculating and punching a check digit from a basic number: Prepare the program card as shown in Figure 10-6. Feed and register a card at the punch station. The basic number to be entered is 34628.

Card lever picks XFER INT during a card-feed cycle.

Column 1

ACTION	RESULT
Switch in punch	Pick GEN
3-program contact	Pick ×2, FLD 1
3-key pressed	Pick 3-interposer, T4, T2
P2 (N/C) (M-135°)	Hold T4, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T4, T2	Pick A4, A2, FLD 2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A2	Hold A4, A2
P2 (B-65°)	Drop T4, T2
P5 (M-86°)	Pick XFER INT

Final result: 6 stored in add relays (A4, A2).

Column 2

ACTION	RESULT
2-program contact	Pick FLD 1
4-key pressed	Pick 4-interposer, T8, T2
P2 (N/C) (M-135°)	Hold T8, T2
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T8, T2	Pick A8, A2
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A8, A2	Hold A8, A2
P2 (B-65°)	Drop T8, T2
P5 (M-86°)	Pick XFER INT

Final result: 0 stored in add relays (A8, A2).

Column 3

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
6-key pressed	Pick 6-interposer, T2, T1
P2 (N/C) (M-135°)	Hold T2, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T2, T1	Pick A2, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A2, A1	Hold A2, A1
P2 (B-65°)	Drop T2, T1
P5 (M-86°)	Pick XFER INT

Final result: 3 stored in add relays (A2, A1).

Column 4

ACTION	RESULT
2-program contact	Pick FLD 1
2-key pressed	Pick 2-interposer, T4, T1
P2 (N/C) (M-135°)	Hold T4, T1
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock and punch clutch
P6 (B-3°)	Drop XFER INT
P3 (M-5°), T2, T1	Pick A4, A1
FLD 2, +48v	Hold FLD 2
P6 (M-53°), A4, A1	Hold A4, A1
P2 (B-65°)	Drop T4, T1
P5 (M-86°)	Pick XFER INT

Final result: 5 stored in add relays (A4, A1).

Column 5

ACTION	RESULT
3-program contact	Pick ×2, FLD 1
8-key pressed	Pick 8-interposer, T2
Interposer bail contact	Escape magnet (180°-230°)
Escape armature contact	Escape interlock and punch clutch

Final result: T2 picked, punch an 8 in column 5, escape to column 6.

Column 6

ACTION	RESULT
2 and 3 program contact	Pick TEST
P2 (M-135°), FLD 1, FLD 2	Hold T2
P7 (M-241°), TEST, GEN	Hold TEST
TEST, GEN	Prevent picking A2
P5 (M-86°), TEST, FLD 1 (N/O), GEN, T2	Pick 8-interposer
TEST, GEN	Prevent picking transfer and add relays
Interposer bail contact	Escape magnet
Escape armature contact	Escape interlock; punch column 6, escape to column 7

Final result: Nothing stored in add relays.

Chapter 11. Self-Checking Number Feature, Modulus 11, and Self-Checking Number Generator Feature

Theory of Operation

- **The modulus 11 self-checking number feature detects punching errors by the time the end of a field is reached.**

The Self-Checking Number Feature, Modulus 11, is available only for the IBM 29 Model A. It is not compatible with two other features: auxiliary duplication and self-checking number feature, modulus 10.

The modulus 11 technique of self-checking predetermined numbers (such as account numbers, part numbers, or order numbers) detects any error by the time the end of the field is punched. The method detects single-digit mispunches, single transpositions, and double transpositions.

The modulus 11 technique differs from that of other systems in that it applies five different weights (checking factors) to the digit positions in the basic number, to calculate a check digit. The check digit is added at the right of the basic number to form the self-checking number.

The check digit can be determined by IBM computer calculation, by manual arithmetic, or by using the self-checking number generator feature which may be installed with the modulus 11 feature.

Calculation of the Check Digit

- **The check digits are developed from the value and position of each basic number digit.**
- **Numbers that generate a check digit of 10 must be excluded.**

The decimal value of the check digit is derived from the value and position of each digit of the basic number. Each position of the basic number has a pre-assigned checking factor. Starting with the low-order position of the basic number, the checking factors are 2, 3, 4, 5, 6, 7. If a basic number is longer than six digits, the sequence of checking factors is repeated.

Figure 11-1 shows an example with an account number as the basic number. The pre-assigned checking factors are shown below each position of the basic number. The check-digit value of the account number is computed manually as follows:

1. Multiply the value of each digit position by its checking factor. Add the resulting products together.
2. Divide the sum of the products by 11.
3. Subtract the remainder from 11. The result is the check-digit value for the account number. Place the check digit to the right of the basic account number to make a self-checking account number.

The modulus 11 self-checking number system has one restriction. Some basic numbers generate a check-digit value of 10. Because only one digit position is reserved for the check digit, all basic numbers that generate a check digit of 10 must be excluded from a sequence numbering system that uses a modulus 11 self-checking feature.

Program Card

- **Checking factors are defined (controlled) by the auxiliary program drum card.**

Because the modulus 11 program card requires more codes (punching positions) than are available on the standard program card, an auxiliary program drum is installed as part of the modulus 11 feature.

For program 1, the rightmost position of the self-checking number field (the check digit column) is punched 12-3. Proceeding to the left, the next column is punched 3, and successive columns are punched 2, 1, 0, 11, 12. If additional positions require coding, the sequence is repeated, starting with 3, and continuing until the high-order position of the field is reached.

For program 2, the check digit field is punched 4-9; the remaining positions are punched, from right to left, with 9, 8, 7, 6, 5, 4, and the sequence is repeated up to the high-order position.

Operating Procedure

- **Numbers to be checked are keyed manually or duplicated automatically.**

In normal operation, the account number is keyed and punched through the check-digit position. Internal circuits verify the accuracy of the keying or validity

Account Number:	9	4	3	4	5	7	8	4	2	
Checking Factors:	x4	x3	x2	x7	x6	x5	x4	x3	x2	
1. Multiply and Add:	36	+ 12	+ 6	+ 28	+ 30	+ 35	+ 32	+ 12	+ 4	= 195

2. Divide: 195 ÷ 11 = 17 and a Remainder of 8

3. Subtract: 11 - 8 = 3 Check Digit Value

Self-Checking Account No. 9434578423

Figure 11-1. Arithmetic Method of Finding Check-Digit Value

of the account number and, if correct, automatically punch an 11 in column 81. (On machines processing short cards, the 11-punch will appear in column 52, 61, or 67, depending on the card length.)

An error is signaled by a red light on the keyboard after the last digit of the self-check field is punched. A 12 is automatically punched over the check-digit column, and the keyboard is held restored. To release the card and unlock the keyboard, the error-reset key is pressed. Whenever such an error occurs, the 11 punch in column 81 is suppressed.

When more than one self-checking field is programmed, the successful keying of any *one* field can produce an 81X if the other fields are skipped or bypassed by a change in program level. The appearance of an 81X signifies that all self-checking fields that are *punched* in the card are correct, whether keyed or duplicated. Skipping or bypassing an entire self-checking field is a valid operation.

Duplication

Duplication of a self-checking number field, or part of a self-checking number field, is possible but must be initiated in the high-order position of the field. Duplication may be initiated by a 0-punch (6-punch in program 2) in the main program card (high-order position) or by pressing the duplicate key. In either case, the portion of the field to be duplicated *must* be defined in the main program card (by 12 or 4 punches). If only part of the field is to be duplicated, the field definition punch is omitted over the first column of the part to be manually punched. If duplication is initiated at some point after the high-order position of the self-checking field, an error will result.

In the manual keying of a self-checking field, the alpha shift key can be used when entering an alpha character. This type of self-checking field should not be duplicated.

Operating Information

- **Numbers requiring a check digit of 10 cannot be used.**
- **The number checked and the self-checking field must be equal in number of digits; no spaces are allowed.**
- **Left-aligned numbers cannot be checked.**
- **Self-checking fields must be separated by at least one column.**
- **An 11 in column 81 is not punched when a release follows a checked correct field.**

Basic numbers requiring a check digit of 10 cannot be used as self-checking numbers. The accounting system must be adjusted to remove such numbers from codes that are to be self-checked. If an operator is generating check digits and punches a basic number requiring a check digit of 10, the machine indicates an error condition. It punches a 12 in the check-digit column, the error light goes on, and the keyboard locks. The operator must release the card and substitute another basic number.

Although a field to be self-checked may be of any length (up to 79 columns plus the check digit), once the predetermined field length has been programmed for self-checking, all numbers to be self-checked *must* contain the same number of digits as the programmed self-checking field. The check digit *must* always occupy the units position of the self-checking number field.

The modulus 11 technique of self-checking is not valid with left-aligned (left-base) numbers.

More than one self-checking field can be checked per card, but self-checking fields must be separated by at least one card column. When the first self-checking field with an error is detected, a 12 is punched over the check-digit position of the field. The card is released by pressing the error-reset key.

If the remainder of the card is to be skipped after the end of a self-checking field, skipping can be initiated by program control or the skip key. Skipping can be initiated by the skip key only when in the high-order position of the self-checking field. The skip circuit is broken when the field-2 relay is picked after the first key is pressed in a self-checking number field. If the release key is used for this skipping, the X in column 81 is not punched, even though the self-checking field is correct.

In the first column of a self-checking field, the following operations can be performed:

1. The field can be manually keyed and the validity of the number is checked by the arithmetic circuits.
2. When the self-check field has no spaces, the entire field (or part of the field) can be duplicated and checked by use of the duplicate key.
3. The entire field can be manually skipped without calculation.
4. A shift in program level can bypass the entire field.

Once keying of the self-checking field has started, the manual dup, manual skip, program-1, and program-2 keys are all inoperative.

The release key is not inhibited unless a checking error has been indicated. The release can be used in a self-checking field if the operator has miskeyed and wishes to make over the card.

Raising the starwheels on the main program drum transfers an interlock switch and energizes the auxiliary drum interlock relay. An N/C point of this relay breaks the common line to the auxiliary drum sensing contacts.

Functional Units

- **The self-checking feature consists of an adder matrix and a multiplier matrix of relay points.**
- **The multiplier matrix is controlled by starwheel sensing of the auxiliary drum unit.**
- **The adder matrix is controlled by the sum of digits punched, less carries.**
- **Binary relay storage is used for the sum of the addition.**

Additions to the basic IBM 29 are:

1. An error light on the left of the keyboard cover.
2. An auxiliary program drum.
3. A toggle switch (CHK/PUNCH) on the keyboard (if the Generator feature is installed).

Basic card-punch circuitry is virtually unchanged. This circuitry and the additional modulus 11 operate entirely in 48v relay logic. On reed-relay machines, the modulus 11 circuitry uses wire-contact relays. The relays are mounted on a feature gate that can be inserted in the rear position of the relay gate slide assembly (behind the reed relay card). Figure 11-2 shows the location of the self-checking gate assembly and the base machine reed relay circuit card in the horizontal position. The self-checking gate assembly can be partially pulled out of the slide assembly for servicing. Three paddle cards (3A, 3B, and 3C) connect the self-checking feature to the machine circuits. The paddle-card connections are designated in the same manner as the reed relay circuit card tabs. Figure 11-3 shows the wire-contact relay machine. Diodes are used extensively on both types of machines to prevent back circuits, to minimize effects of back emf, and to develop logic at the adder matrix output.

The self-checking number feature consists of a single-character, base-11 multiplier matrix and a single-character, base-11 adder matrix.

The multiplier matrix is a series of relay points controlled according to the assigned factor for the digit position in the self-checking number. The input to this matrix is the same impulse that is sent to the punch magnet. The output is the punched digit value multi-

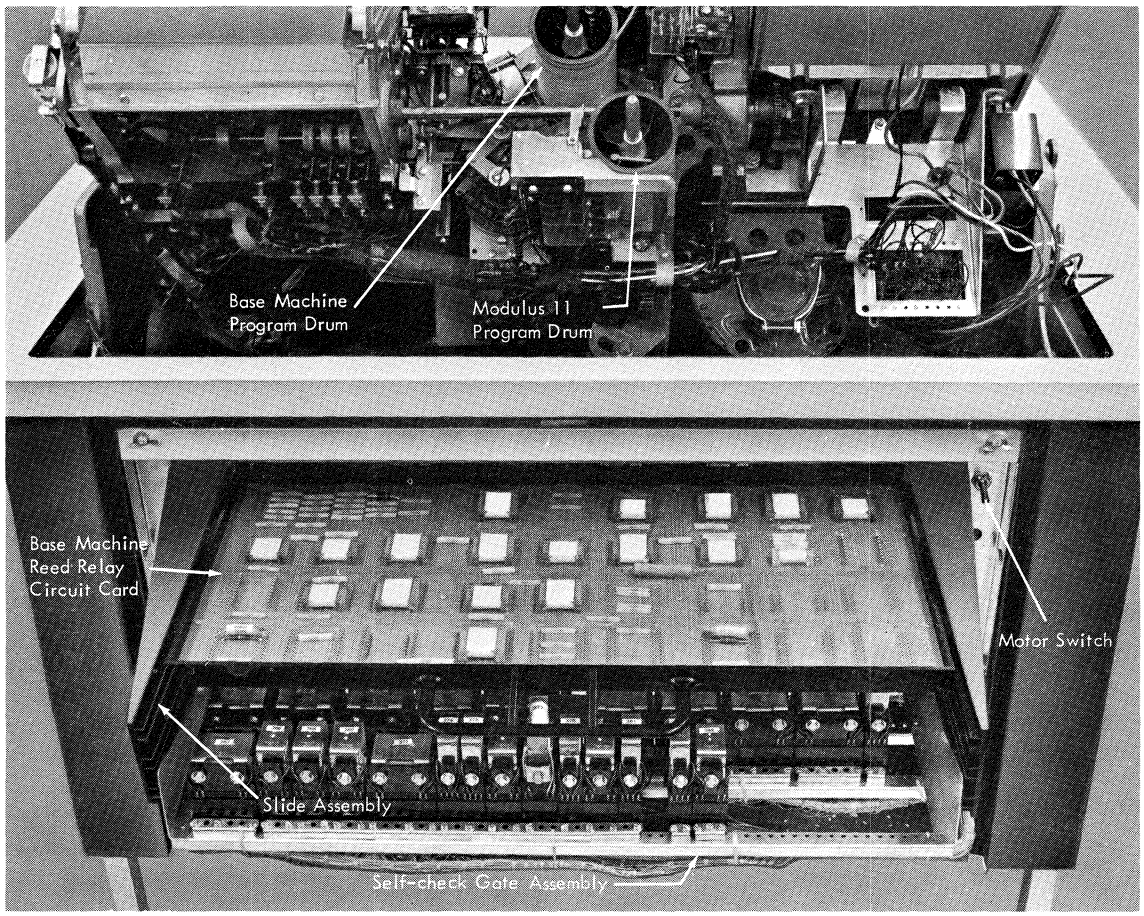


Figure 11-2. Rear View of Reed-Relay Machine (Modulus 11)

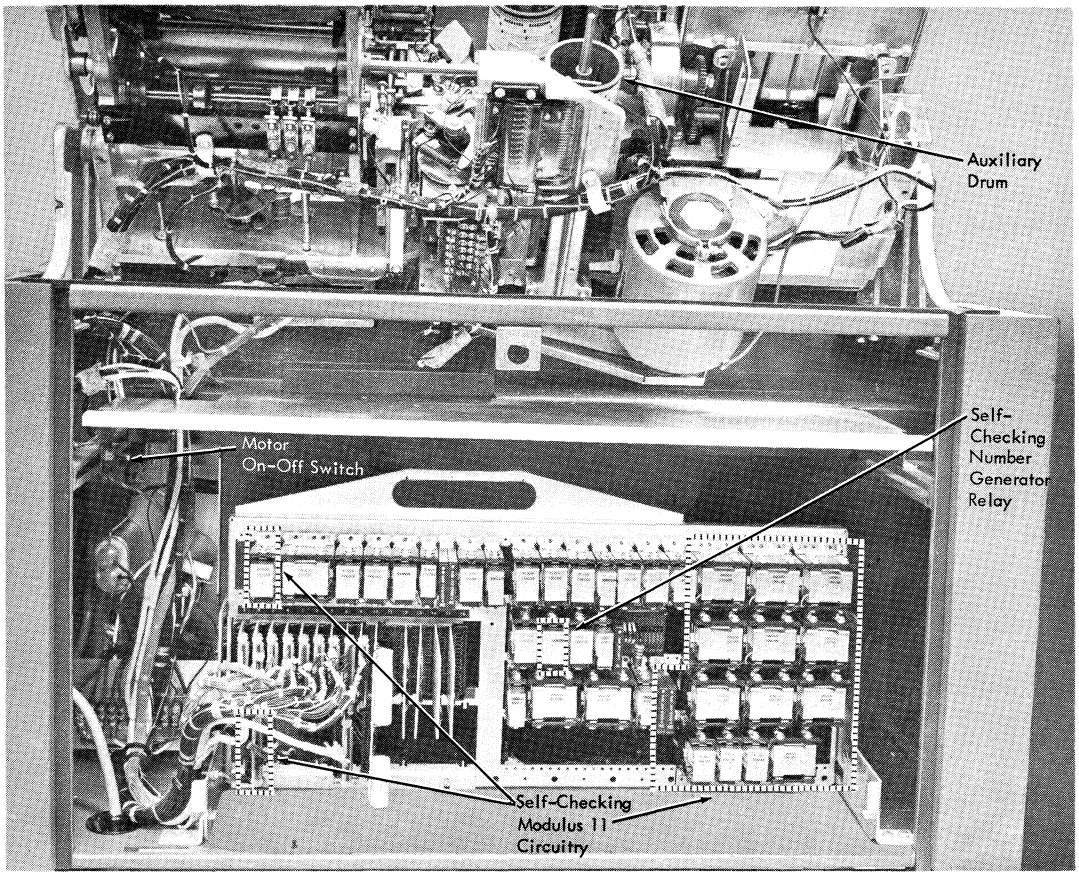


Figure 11-3. Rear View of Wire-Contact Relay Machine (Modulus 11)

plied by the assigned factor. The matrix does not contain circuitry to retain carries, and carries are purposely lost.

The adder matrix is a series of relay points controlled according to the accumulated total of previous digits punched. The input to this matrix is the output of the multiplier matrix. The output is the sum of the previously punched digits plus the multiplier matrix output. The adder matrix does not contain circuitry to retain carries, and carries are purposely lost.

The binary-coded relays retain the single-digit result of the addition. These relays are assigned the values 1, 2, 4, and 8. The digit value to be retained is determined by the sum of the values of the relays picked.

The program card defines (controls) the assigned factors and the field length. Program sensing contacts for positions 12 through 3 (program 1) or 4 through 9 (program 2) pick multiplier relays ×7 through ×2. The contact impulses also pick the field-1 relay to define a self-checking number field.

The check-digit column of the self-checking program card is defined by a multipunched 12 and 3 or a 4 and 9. The check digit is added to the accumulated sum and should result in a zero balance in the adder relays.

Servicing of the feature is simplified by an orderly design arrangement of relay points in the matrices. Relay points assigned each signal path correspond to the digit value.

Principles of Operation

- **Arithmetic with a base of 11 is used.**
- **Carries occur on multiples of 11 and are not retained; only the units digit is used.**
- **Multiplication, then subtraction of the highest multiple of eleven from the product, gives a figure that is the check digit.**
- **Columns are checked left to right.**
- **A sum of 11 (T8, T2, and T1) in the transfer relays results in a zero balance (OK condition) when tested.**

This self-checking feature is called modulus 11 because arithmetic with a base of 11 is used in the checking operation. A carry occurs on a multiple of 11, rather than on a multiple of 10 as in the base-10 arithmetic customarily used. Figure 11-4 shows the results of

base-11 additions. Because a single-digit check character is used, only that portion of the sum over 11 is retained. For example: 9 + 7 = 16; 16 − 11 = 5. The addition table shows that 9 + 7 = 5. The values to the right of the diagonal line in the addition table are sums over 11.

Past Prod Sum	Next Product (Digit Value X Check Factor)										
	0	1	2	3	4	5	6	7	8	9	10
0	11	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	0
2	2	3	4	5	6	7	8	9	10	0	1
3	3	4	5	6	7	8	9	10	0	1	2
4	4	5	6	7	8	9	10	0	1	2	3
5	5	6	7	8	9	10	0	1	2	3	4
6	6	7	8	9	10	0	1	2	3	4	5
7	7	8	9	10	0	1	2	3	4	5	6
8	8	9	10	0	1	2	3	4	5	6	7
9	9	10	0	1	2	3	4	5	6	7	8
10	10	0	1	2	3	4	5	6	7	8	9
11	0	1	2	3	4	5	6	7	8	9	10

Figure 11-4. Modulus 11 Addition Table

Digit Value	Checking Factors						
	x2	x3	x4	x5	x6	x7	
0	0	0	0	0	0	0	
1	2	3	4	5	6	7	
2	4	6	8	10	1	3	-11
3	6	9	1	4	7	10	
4	8	1	5	9	2	6	-22
5	10	4	9	3	8	3	-33
6	1	7	2	8	3	9	
7	3	10	6	2	9	5	-44
8	5	2	10	7	4	1	-55
9	7	5	3	1	10	8	

Figure 11-5. Modulus 11 Multiplication Table

The same base-11 theory is used to develop the multiplication table in Figure 11-5. For example: 8 × 5 = 40; 40 − 33 = 7. The table shows that 8 × 5 = 7. The multiples of 11 that are subtracted from the product appear to the right of the table.

Machine Operation

- **Numbers to be self-checked can be automatically duplicated or keyed manually.**
- **A correct data card is 11-punched in column 81.**
- **An incorrect data card is 12-punched in the check-digit column, and the error light is turned on.**
- **The error-reset key is used to restore the machine and release the error card.**

In most cases, the self-checking number is punched manually from the keyboard. However, any part of the number can be automatically duplicated and checked. Duplication must begin with the high-order position of the self-checking number. Partial field duplication must be controlled by the program card.

Correct verification of all self-checking numbers in a card results in an 11-punch in column 81 of the card. If an error occurs, a 12 is punched in the check-digit column of the self-checking number in error, and the machine locks with the error light on. Press ERROR RESET to turn out the error light and unlock the machine.

Punch the auxiliary drum program card for the length of the self-checking field. The check-digit position contains a 12-3 or a 4-9 punch (program 1 or program 2) combination. Figure 11-6 shows the self-checking field of a program card (for program 2). The length of this self-checking field is ten digits, starting in column 1. The high-order position of the self-checking field on the main program drum is not punched.

Circuit Operation

- **The self-checking factors are defined by a card on the auxiliary drum.**
- **Multiplier output is the product of the digit times the checking factor.**
- **Multiplier output is added to the previous product sum in the adder matrix.**
- **The adder relays hold the accumulated product totals.**
- **The check digit, when added to the sum in the adder relays, produces a zero balance (T8, T2, and T1) in the transfer relays, which causes an OK relay to be picked.**
- **Values left in the transfer relays other than 11 (zero balance) cause the error relay and 12-interposer punch magnet to be picked.**

Figure 11-7 shows the logic of the modulus 11 self-checking feature as it appears in the IBM 29 Card Punch. The weighted checking factors are defined in the self-checking field of the program card. The operator keys the self-checking numbers at the keyboard.

A program sensing contact picks a corresponding multiplier (×) relay. The transferred relay points in the multiplier cause the digit value from the keyboard

to be multiplied by the checking factor for that digit position. The resulting output of the multiplier is the product.

The output of the multiplier enters the adder relay matrix. There, the product sum from the previous operation adds to the multiplier output. The transfer relays store the new product sum. The transfer relays, in turn, send the new sum to the adder relays. At the completion of each column of operation, the adder relays contain the accumulated product total of digit values multiplied by the weighted-checking factors.

The right-hand portion of Figure 11-7 contains the logic needed for the check-digit column. At this point, punch the check digit to verify its preceding basic number. The 12-3 or 4-9 punching in the auxiliary program card activates the test circuit. When the operator keys the check-digit value, the value is multiplied by one and is added to the total in the adder relays. The result in the transfer relays conditions the test circuit. If the final sum in the transfer relays is 11 (zero balance), an OK relay is picked. If the transfer relays contain any result other than 11, the error relay, error light, and the 12-interposer punch magnet are picked.

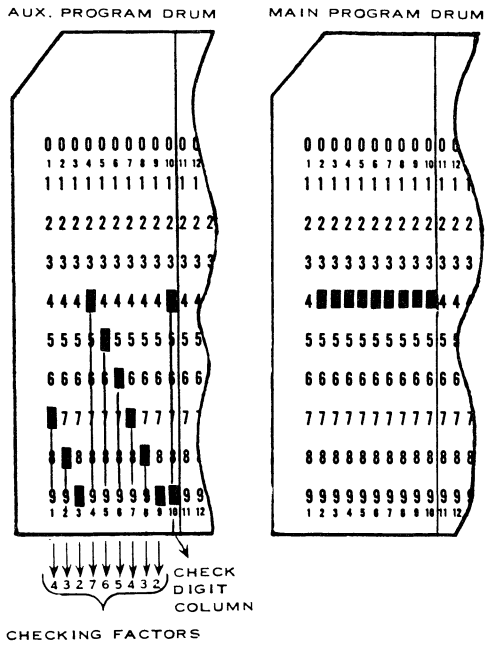


Figure 11-6. Self-Checking Field Defined by Program Card (Program Level 2)

Sequence of Events

Figure 11-8 shows the sequence of events when the operator punches the two low-order positions of a self-checking number. The events outlined in blocks 1-5 occur at each column of the self-checking field. Blocks 6 and 7 occur only when the check-digit position is sensed.

Operational Flow Chart

The flow chart in Figure 11-9 illustrates the circuit action of the modulus 11 self-checking number feature when a typical card is processed. The card is punched 1562 beginning in column 1. The auxiliary program card is punched beginning in column 1 with 7, 8, 9, and the check-digit column with a 9 and 4 (column 4). The machine is in program 2 mode.

Circuit Objectives: Correct Number (Reed Relay)

The ACTION column does not necessarily mean actions by an operator. It contains circuit initiators such as contacts closed by keys, cams, and relays. The RESULT column gives the effect of the action on the circuit. With a five-column self-checking field programmed, the number 51136 is to be entered from the keyboard and checked for validity.

CF4 picks XFER INT during the card feed cycle.

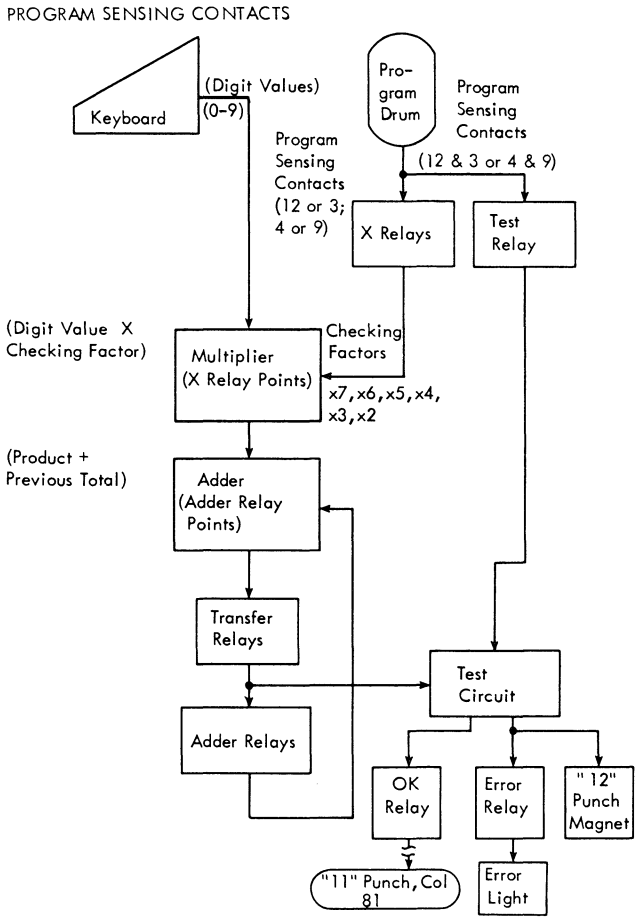
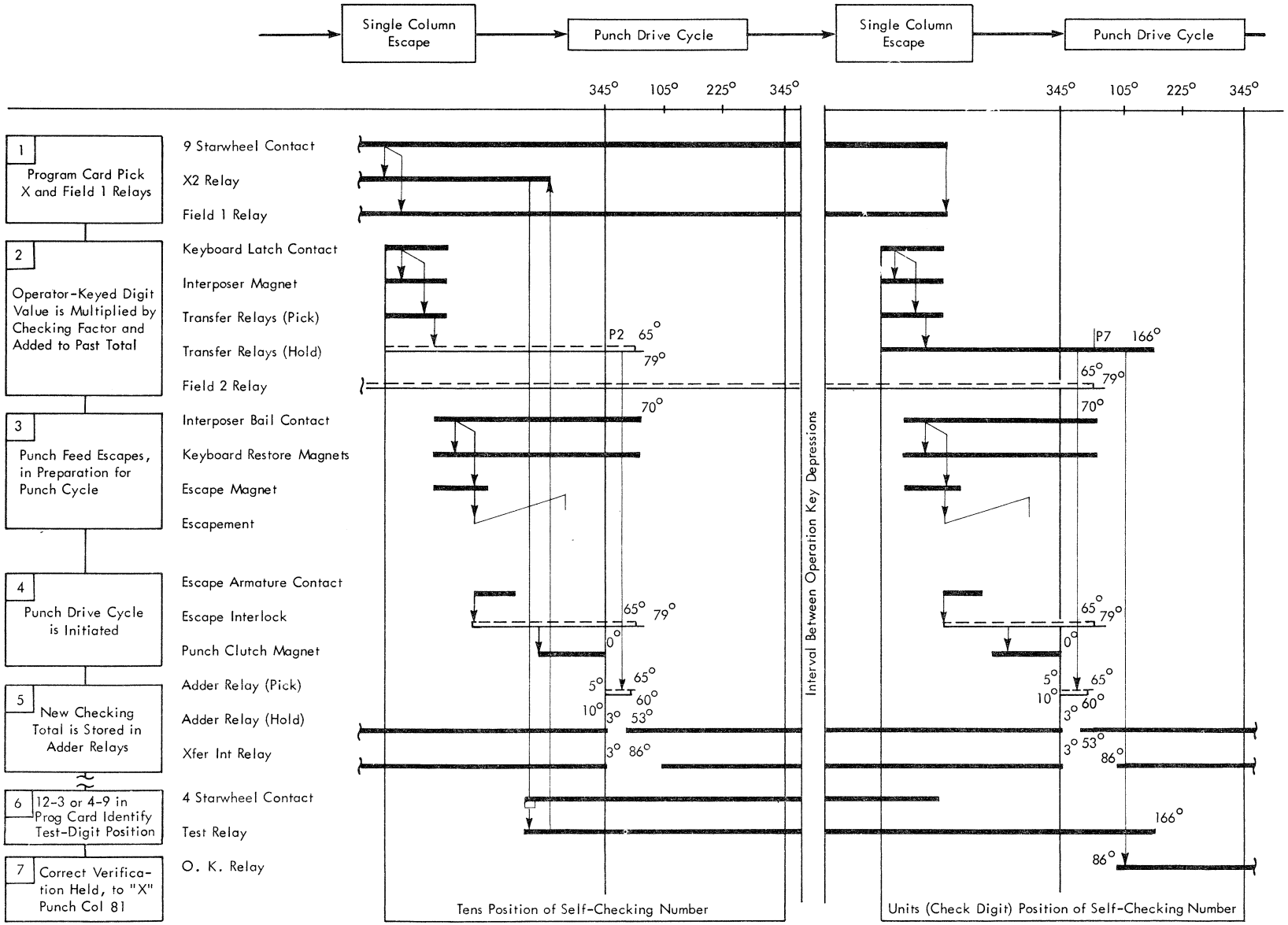


Figure 11-7. Logic of Modulus 11 Self-Checking Feature



Note: Where timings differ, dashed line indicates wire-contact relay machine timing; solid line indicates reed-relay machine timing.

Figure 11-8. Sequence (Checking the Tens and Units Positions of a Number)

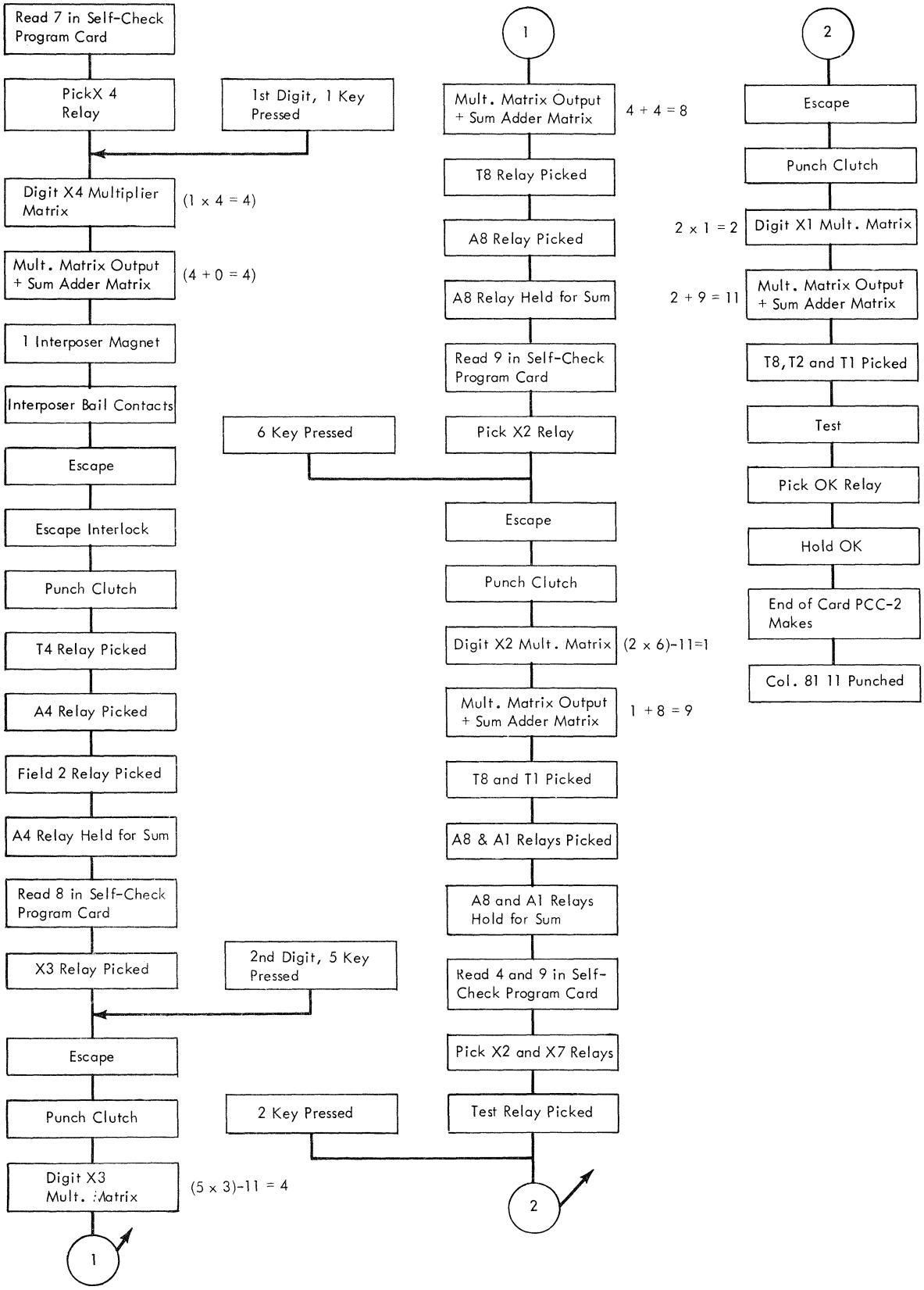


Figure 11-9. Operational Flow Chart

Column 1

ACTION	RESULT
0 program contact	×5, FLD 1 pick
5 key pressed	5-interposer, T1, T2 pick
P2 (N/C) (M-149°)	T1, T2 hold
Interposer bail contact	Escape magnet
Escape arm contact	Escape interlock, punch clutch
P6 (B-3°)	XFER INT drops
P3 (M-10°), T1, T2	FLD 2, A1, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A1, A2	A1, A2 hold
P2 (M-149°), FLD 2	FLD 2, T1, T2 hold
P5 (M-86°)	XFER INT pick

Final result: 3 stored in add relays (A1, A2).

Column 2

ACTION	RESULT
1 program contact	×4, FLD 1 pick
1 key pressed	1-interposer, T1, T2, T4 pick
P2 (N/C) (M-149°)	T1, T2, T4 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-10°), T1, T2, T4	A1, A2, A4 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A1, A2, A4	A1, A2, A4 hold
P2 (M-149°), FLD 2	FLD 2, T1, T2, T4 hold
P5 (M-86°)	XFER INT pick

Final result: 7 stored in add relays (A1, A2, A4).

Column 3

ACTION	RESULT
2 program contact	×3, FLD 1 pick
1 key pressed	1-interposer, T8, T2 pick
P2 (N/C) (M-149°)	T8, T2 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-10°), T8, T2	A8, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°) A8, A2	A8, A2 hold
P2 (M-149°), FLD 2	FLD 2, T8, T2 hold
P5 (M-86°)	XFER INT pick

Final result: 0 stored in add relays (A8, A2).

Column 4

ACTION	RESULT
3 program contact	×2, FLD 1 pick
3 key pressed	3-interposer, T4, T1 pick
P2 (N/C) (M-149°)	T4, T1 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-10°), T4, T1	A4, A1 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A4, A1	T4, T1 hold
P5 (M-86°)	XFER INT pick

Final result: 5 stored in add relays (A4, A1).

Column 5 (Last column of field)

ACTION	RESULT
12 & 3 program contact	Pick TEST
6 key pressed	6-interposer, T8, T2, T1 pick
P6 (M-53°), A8, A2, A1	A8, A2, A1 hold
P2 (M-149°), FLD 2	Hold T8, T2, T1
P7 (M-241°), TEST	Hold TEST
P5 (M-86°), TEST, FLD 1	Pick OK. Hold OK until following position or column 81

Final result: 11 (zero balance) stored in add relays (A8, A2, A1).

Column 81

ACTION	RESULT
PCC1, OK	Pick 11 interposer

Circuit Objectives: Error Condition (Reed Relay)

Punch a 5 in the units position of the preceding example instead of the 6 (punch 51135).

Columns 1 through 4:

ACTION	RESULT
Same as preceding example	5 stored in add relays

Column 5

ACTION	RESULT
12 & 3 program contact	Pick TEST
5 key pressed	5-interposer, T8, T2 pick
P2 (N/C) (M-149°)	T8, T2 hold
Interposer bail contact	Escape, punch
P3 (M-10°), T8, T2	A8, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A8, A2	A8, A2 hold
P2 (M-149°), FLD 2	Hold T8, T2
P7 (M-241°), TEST	Hold TEST
P5 (M-86°), TEST, FLD 1	Pick ERR and 12-interposer
ERR	Pick MP and release
MP	Block escapement and punch 12 over units position
Error-reset key pressed	Resets error condition and releases the card

Circuit Objectives: Correct Number (Wire-Contact Relay)

The ACTION column does not necessarily mean actions by an operator. It contains circuit initiators such as contacts closed by keys, cams, and relays. The RESULT column gives the effect of the action on the circuit. With a five-column self-checking field programmed, the number 51136 is to be entered from the keyboard and checked for validity.

Card lever picks XFER INT during the card feed cycle.

Column 1

ACTION	RESULT
0 program contact	×5, FLD 1 pick
5 key pressed	5-interposer, T4, T2 pick
P2 (N/C) (M-135°)	T4, T2 hold
Interposer bail contact	Escape magnet
Escape arm contact	Escape interlock, punch clutch
P6 (B-3°)	XFER INT drops
P3 (M-5°), T1, T2	FLD 2, A1, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A1, A2	A1, A2 hold
P2 (M-135°), FLD 2	T1, T2 hold
P5 (M-86°)	XFER INT pick

Final result: 3 stored in add relays (A1, A2).

Column 2

ACTION	RESULT
1 program contact	×4, FLD 1 pick
1 key pressed	1-interposer, T1, T2, T4 pick
P2 (N/C) (M-135°)	T1, T2, T4 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-5°), T1, T2, T4	A1, A2, A4 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A1, A2, A4	A1, A2, A4 hold
P2 (M-135°), FLD 2	T1, T2, T4 hold
P5 (M-86°)	XFER INT pick

Final result: 7 stored in add relays (A1, A2, A4).

Column 3

ACTION	RESULT
2 program contact	×3, FLD 1 pick
1 key pressed	1-interposer, T8, T2 pick
P2 (N/C) (M-135°)	T8, T2 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-5°), T8, T2	A8, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A8, A2	A8, A2 hold
P2 (M-135°), FLD 2	T8, T2 hold
P5 (M-86°)	XFER INT pick

Final result: 0 stored in add relays (A8, A2).

Column 4

ACTION	RESULT
3 program contact	×2, FLD 1 pick
3 key pressed	3-interposer, T4, T1 pick
P2 (N/C) (M-135°)	T4, T1 hold
Interposer bail contact	Escape, punch
P6 (B-3°)	XFER INT drops
P3 (M-5°), T4, T1	A4, A1 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A4, A1	T4, T1 hold
P5 (M-86°)	XFER INT pick

Final result: 5 stored in add relays (A4, A1).

Column 5 (Last column of field)

ACTION	RESULT
12 & 3 program contact	Pick TEST
6 key pressed	6-interposer, T3, T2, T1 pick
P6 (M-53°), A8, A2, A1	A8, A2, A1 hold
P2 (M-135°), FLD 2	Hold T8, T2, T1
P7 (M-241°), TEST	Hold TEST
P5 (M-86°), TEST, FLD 1	Pick OK. Hold OK until following position or column 81

Final result: 11 (zero balance) stored in add relays (A8, A2, A1).

Column 81

ACTION	RESULT
PCC1, OK	Pick 11-interposer

Circuit Objectives: Error Condition (Wire-Contact Relay)

Punch a 5 in the units position of the preceding example instead of the 6 (punch 51135).

Columns 1 through 4:

ACTION	RESULT
Same as preceding example	5 stored in add relays

Column 5

ACTION	RESULT
12 & 3 program contact	Pick TEST
5 key pressed	5-interposer, T8, T2 pick
P2 (N/C) (M-135°)	T8, T2 hold
Interposer bail contact	Escape, punch
P3 (M-5°), T8, T2	A8, A2 pick
FLD 2, +48V	FLD 2 hold
P6 (M-53°), A8, A2	A8, A2 hold
P2 (M-135°), FLD 2	Hold T8, T2
P7 (M-241°), TEST	Hold TEST
P5 (M-86°), TEST, FLD 1	Pick ERR and 12-interposer
ERR	Pick MP and release
MP	Block escapement and punch 12 over units position
Error-reset key pressed	Resets error condition and releases the card

Self-Checking Number Generator

- **The self-checking number generator (standard for Modulus 10) is a feature for Modulus 11. A switch is provided on the keyboard to select check mode or punch mode.**
- **The machine can calculate the check digit during keying and punch it out.**
- **The field size must provide for the check digit.**
- **Program codes are identical to those used with the basic modulus 11 feature.**

The generator is a feature that can be added to modulus 11. The generator sets up and punches the correct check digit immediately after the basic number is punched. Because the operator does not key the check digit, this is *not* a checking operation.

The procedure for generating self-checking numbers is the same as the self-checking operation except that the self-check switch is on PUNCH. The switch position holds the generate relay up continuously. Figure 11-10 shows the sequence of events when the operator keys the low-order position of the basic number.

The check-digit impulse is generated during the punch cycle for the units position of the basic number. The add relays are not picked. The impulse from P5 goes through TEST and field-1 relay points and a combination of transfer relay points as determined by the value present in the transfer relays. The resulting output from one of the T1 points energizes the interposer magnet for the correct check-digit value. Another escape-and-punch cycle is required to punch the check digit value into the next column. Note that the check digit is an 11's complement of the value in the transfer relays. For example, if T4 and T2 are up, a check digit of 5 is punched.

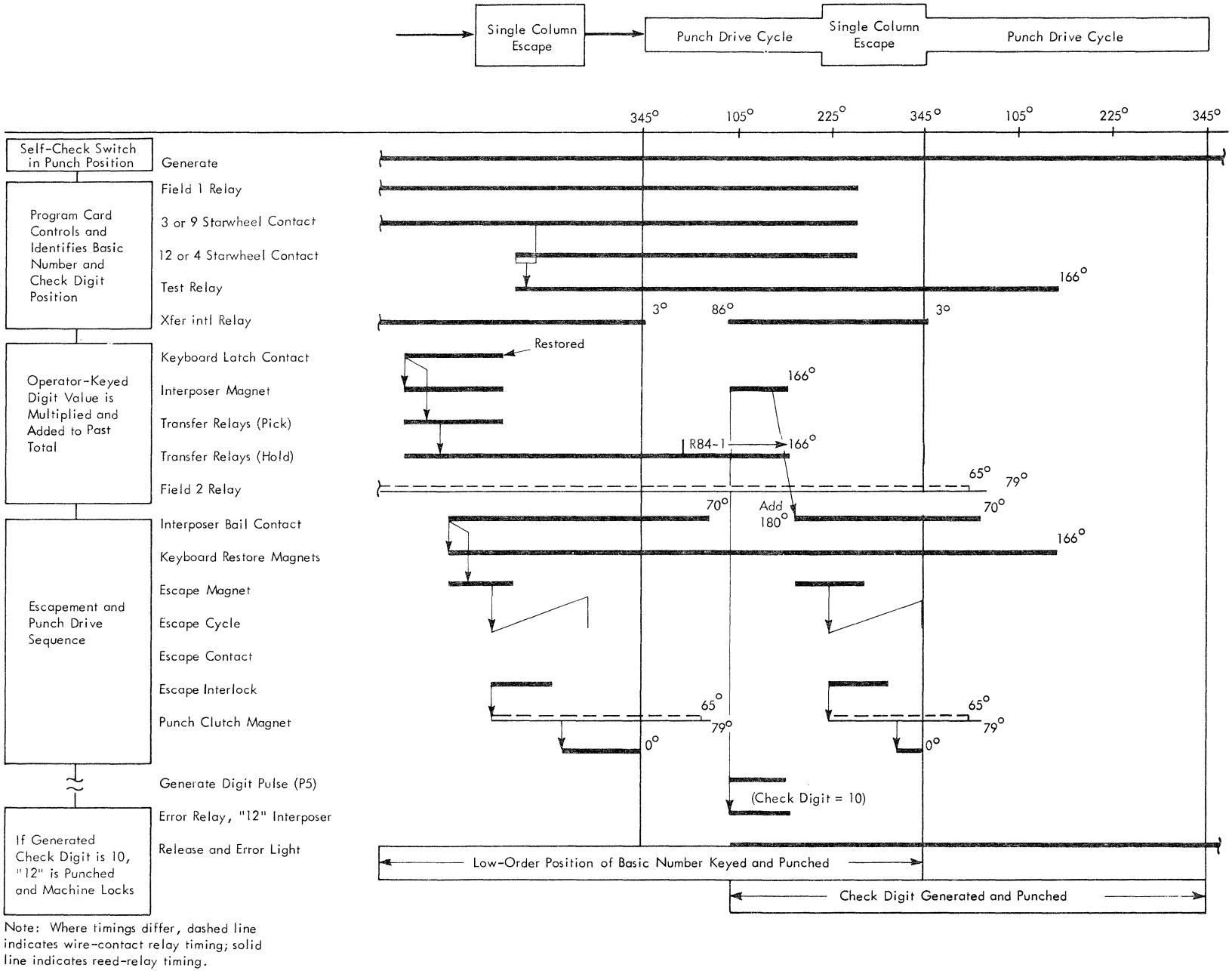
Self-checking numbers with a check-digit value of 10 must be ruled out of the modulus 11 number system. A generated check digit of 10 is indicated if T1 is the only transfer relay in the up position when the check-digit position is reached. In this case, the check-digit impulse goes through T8, T4, and T2 relay points to latch-pick the error relay. The error light comes on, a 12 is punched, and the machine locks. Press ERROR RESET to latch-trip the error relay and release the card.

Circuit Objectives (Reed Relay)

The basic number 5113 is keyed in the first four columns of a five-column field.

Columns 1 through 3

ACTION	RESULT
Same as in check operation, except the switch is set to PUNCH	Pick GEN



Note: Where timings differ, dashed line indicates wire-contact relay timing; solid line indicates reed-relay timing.

Figure 11-10. Sequence (Generating the Check Digit)

Column 4

ACTION	RESULT
3 program contact	×2, FLD 1 pick
3 key pressed	3-interposer, T4, T1 pick
P2 (N/C) (M-149°)	T4, T1 hold
Interposer bail contact	Escape to column 4 and punch
P3 (M-10°), T4, T1, +48v	FLD 2 pick and hold
×2, FLD 2, 12 and 3 program contacts	Pick TEST

Column 5

(Note that the add relays are not picked.)

ACTION	RESULT
P2 (M-149°), FLD 2	T4, T1 hold
P7 (M-241°), TEST, GEN	Hold TEST
P5 (M-86°), TEST, FLD 1, GEN, T4, T1	6-interposer
Interposer bail contact	Escape and punch

Final Result: Nothing stored in add relays.
Check digit (6) punched after basic number.

Circuit Objectives (Wire-Contact Relay)

The basic number 5113 is keyed in the first four columns of a five-column field.

Columns 1 through 3

ACTION	RESULT
Same as in check operation, except the switch is set to PUNCH	Pick GEN

Column 4

ACTION	RESULT
3 program contact	×2, FLD 1 pick
3 key pressed	3-interposer, T4, T1 pick
P2 (N/C) (M-135°)	T4, T1 hold
Interposer bail contact	Escape to column 4 and punch
P3 (M-5°), T4, T1 +48v	FLD 2 pick and hold
×2, FLD 2, 12 and 3 program contacts	Pick TEST

Column 5

(Note that the add relays are not picked.)

ACTION	RESULT
P2 (M-135°), FLD 2	T4, T1 hold
P7 (M-241°), TEST, GEN	Hold TEST
P5 (M-86°), TEST, FLD 1, GEN, T4, T1	6-interposer
Interposer bail contact	Escape and punch

Final Result: Nothing stored in add relays.
Check digit (6) punched after basic number.

Chapter 12. IBM 29 Interpreting Card Punch, Model C

Theory of Operation

- **The IBM 29 Model C can be used as a standard printing punch or as a serial interpreter.**
- **The machine interprets prepunched data, column for column, along the top of the card.**

The IBM 29 Model C can be used as a standard printing punch or as a serial interpreter. Mode of operation is controlled by the punch/interpret switch located on the keyboard.

It is not possible to interpret prepunched cards and punch additional information into them during the same card pass. Interpreting takes place at automatic duplication speed, 18 columns per second, and skipping takes place at 80 columns per second.

Punch Mode

With the keyboard punch/interpret switch in the punch position, the Model C operates as a standard IBM 29.

Interpret Mode

With the switch at INTERPRET, all cards fed to the printing station will automatically be interpreted, column for column, above the 12-position of the card column in which the information is punched. All punching is suppressed while the machine is in the interpret mode.

The interpreting operation is similar to an automatic duplicating operation but the card is read at the detail station instead of at the master station. The duplicating sequence causes the machine to take punch-clutch cycles. Information from a column is read on one clutch cycle and printed on the next, and a second column is sensed while the first is being printed.

On each punch-clutch cycle, a character is sensed at the detail station one column before the punches, and interposers are tripped for punching that character on the next cycle. However, because punching is suppressed in the interpret mode, the punches are prevented from rising and only the printing and the sensing of the next column take place. The purpose of suppressing punching while interpreting is to prevent the punches from entering the prepunched holes.

With the mode switch set to INTERPRET, the main-line switch set on, the auto-feed switch set on, and with two cards in the punch bed (one registered), the machine automatically:

1. Interprets prepunched data column-for-column along the top of the card.
2. Suppresses all punching.
3. Spaces over blank columns.
4. Obeys program-card instructions.
5. Continues to feed, register, and stack all output cards until the last card leaves the punch station.

Program-Card Control

- **Skipping while interpreting can be performed only under control of the program card.**
- **Program control eliminates 12- and 11-zone punching for interpreting.**
- **In the interpret mode, only the 0 or 6 program punches change their function.**

When the machine is used as a standard IBM 29, all program codes perform their normal function.

When the machine is used in the interpret mode, the 0 and 6 program punches change their function. Program functions available for punching or interpreting are given in Figure 12-1.

Skipping of all fields not requiring interpreting can be performed only under control of the program card, and with the auto-skip switch on. Skipping cannot be initiated from 11 punches in the cards being interpreted.

Program card control can also eliminate 12- and 11-zone punching for interpreting. Because duplicating is impossible in interpret mode, the 0 and 6 program punches are used to eliminate control punches. Thus, in those control columns so designated (punched 0 or 6 in the program card), only the numeric digits will be sensed and interpreted.

Program 1	Program 2	Punching	Interpreting
12	4	Field definition and suppression of zero printing to the left of the high order digit	Same as for punching
11	5	Initiate skipping	Same as for punching
0	6	Initiate duplicating	X-R elimination in column controlled
1	7	Alpha in column controlled	No function

Figure 12-1. Program-Card Control

Functional Units

- **A sensing unit is added over the punch station.**
- **A magnet and mechanical punch suppression assembly is used when interpreting.**
- **A larger power supply is used.**

The IBM 29 Model C is basically an IBM 29 with a sensing mechanism added to read cards at the punch station and a magnet added to suppress punching while interpreting. Circuitry is added to transfer from a normal punching operation to an interpreting operation.

The sensing unit is shown in Figure 12-2. The punch-suppress magnet is located in the back of the machine, under the CF CB's.

The normal power supply has been replaced by a ferro-resonant supply capable of supplying 2.5 amperes with good regulation, to handle the requirements of the sensing-unit and punch-suppress magnets.

Principles of Operation

- **The card information is sensed on one punch clutch cycle and printed on the second (when interpreting).**
- **The interpreting pin-sense unit reads one column ahead of the printing and punching column.**
- **The punch support assembly is modified with a solenoid-operated mechanism to suppress punching during interpreting.**

The Model C consists of an IBM 29 Printing Card Punch with an interpreting device incorporated in it. This device permits the interpretation of prepunched cards while preserving the functions of the normal IBM 29.

The chip-tube assembly (Figure 12-3) has been redesigned to include a pin-sensing station. The 12 pins, controlled by a magnet assembly, read the card one column before the print station. Information from a column is read in one cycle and interpreted in the next. Because of the reading and punching system used in the IBM 29, no storage is required. Under operating conditions, the sensing unit and chip-tube assembly, together with the print unit assembly, are enclosed by a cover.

The standard print punch support assembly has been modified in the Model C to prevent transfer of motion to the punch during the interpret mode. This "punch-suppression" allows normal use of the code plate shift mechanism when the machine is interpreting. Figure 12-3 shows that the sense-pin holes in the punch die are located one column before the punch position.

Interpret Pin-Sense Unit

The redesigned chip-tube unit on the Model C includes a pin sensing station located one column ahead of the punch (or print) position (Figure 12-3). The punch/interpret switch must be at INTERPRET to accomplish interpreting. The electrical operation is similar to auto-duplication from the master station in the standard IBM 29.

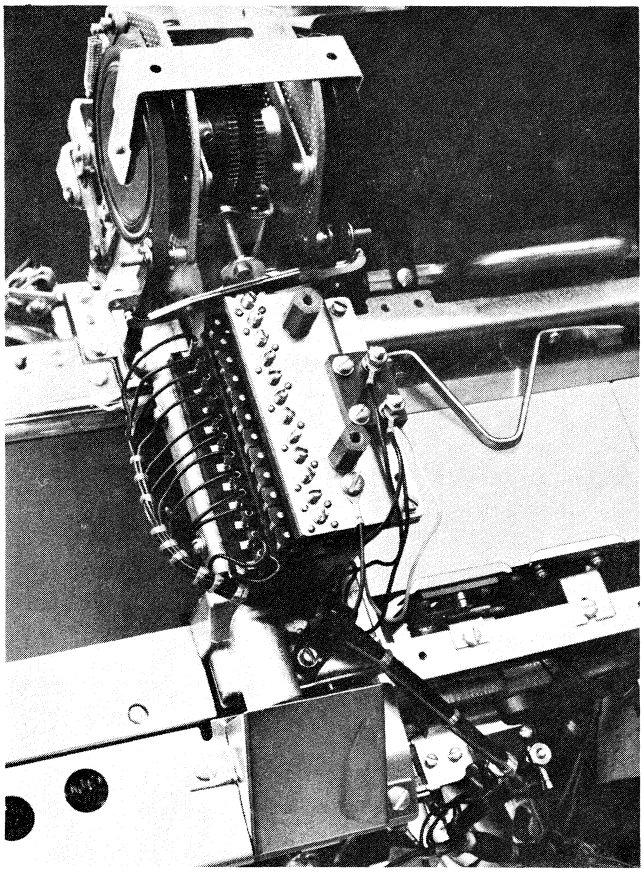


Figure 12-2. Print Pin-Sensing Unit

A dummy punch cycle is taken. During this cycle, a punch cam energizes the sensing magnet in the interpret pin-sense station (Figure 12-3). Energizing this magnet attracts twelve armature straps. Each of these armature straps contains contacts held in an N/O position by 12 interpret sensing pins (spring loaded upward).

Interpreting—Blank Column

When no holes are punched in the column of the card being sensed, the spring tension of the contacts acting down on the sensing pins is insufficient to cause depressions or marks in a blank punching position of the card. The sensing contacts remain in the normally open position.

Interpreting—Hole Sensed

The following sequence takes place when a position is punched in the column of the card being sensed (Figure 12-3).

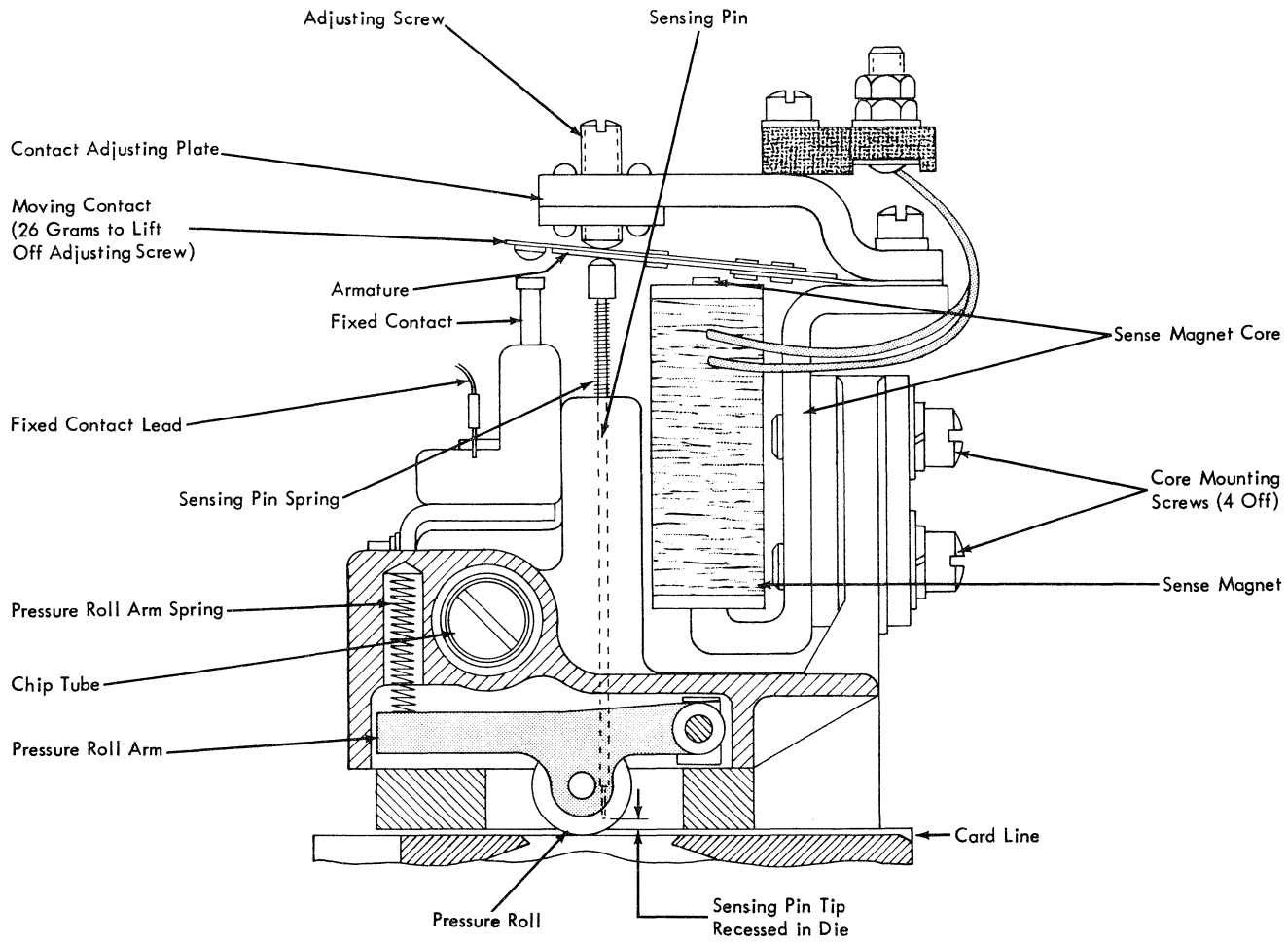


Figure 12-3. Pin-Sense Unit

1. The sensing pin in that position passes through the punched hole, and its sensing contact closes.
2. An interposer magnet is energized.
3. On the next punch cycle, the print interposers shift, because of action of the punch operating arm.
4. The code plate will be positioned to cause printing corresponding to the sensed hole.
5. The cycle in which the first column is interpreted acts as the sensing cycle for the next column. Interpreting proceeds at auto-duplicating speed.

To avoid damage to the code-plate drive, nonstandard multiple punchings should not be interpreted.

Punch Supports and Print Interposer

The print-punch support is in two parts. The upper part, carrying the punch, is linked to the lower part by an operating plate. This operating plate is free to pivot and is acted upon by the transfer plate. The transfer plate is linked to the punch suppress solenoid (Figure 12-4) by means of a bellcrank.

Figure 12-5 shows the operation of the punch supports in both punch mode and interpret mode. Both these views illustrate action when the lower punch support shaft is *raised.*

Punch Mode

In the punch mode (Figure 12-5), the upper and lower punch supports, normally called "punch extensions" on a standard IBM 29, form a solid extension from the punches to the punch operating arm (arms operated by interposer magnet energization and punch clutch action). Pin B (Figure 12-4) is the connecting link between the lower and upper punch supports. When the solenoid is not energized (punch mode), the transfer plate, under spring tension, maintains the operating plate in the punch position.

As the lower punch support is driven upward by the action of the punch operating arm, connecting pin B transmits the upward motion to the operating plate and to its pivot pin C. This action forces the upper punch support upward to drive the punch through the card.

Interpret Mode

In the interpret mode, the punch-suppress solenoid is energized (Figure 12-4). The force acting on the

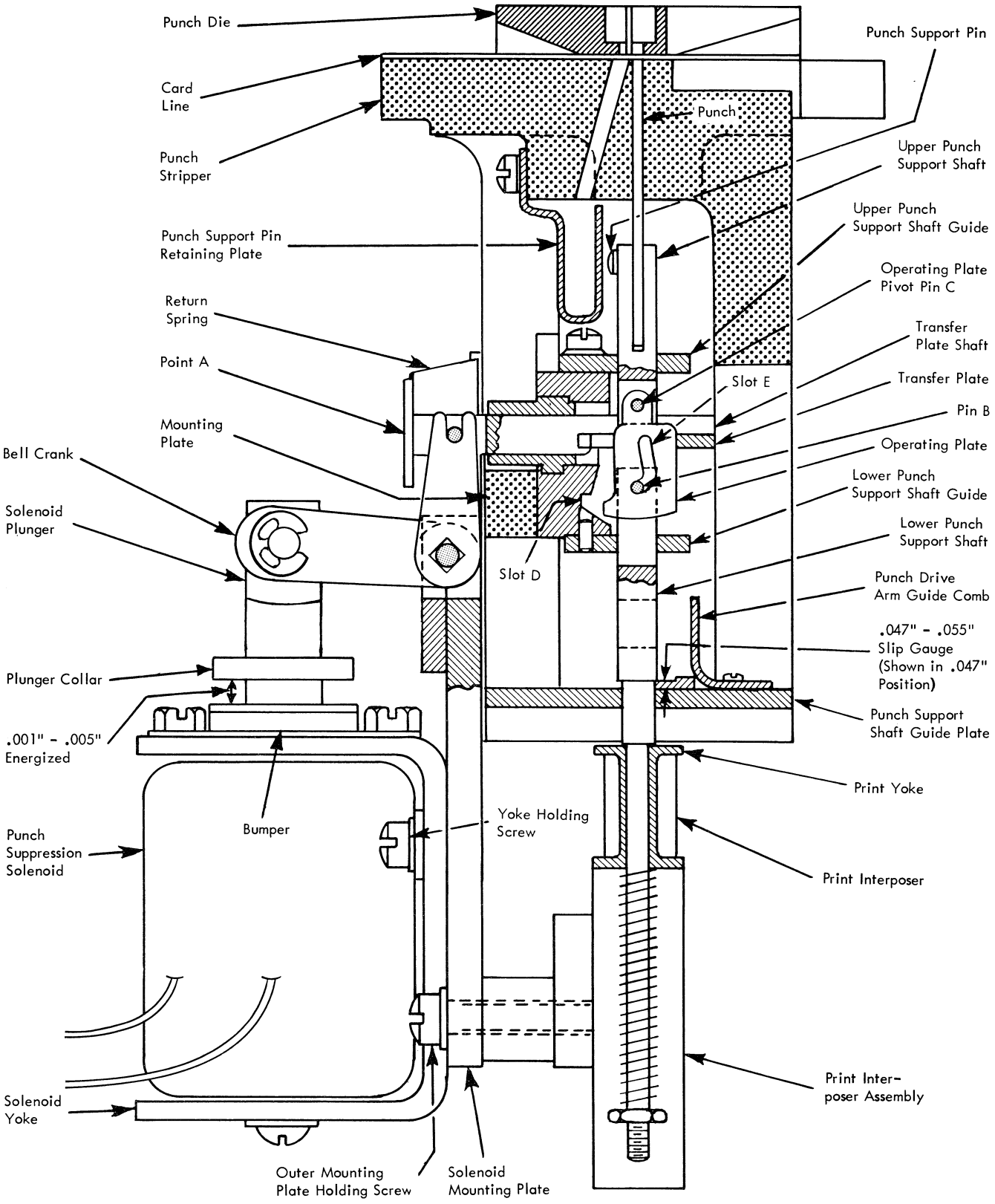


Figure 12-4. Punch-Suppression Mechanism

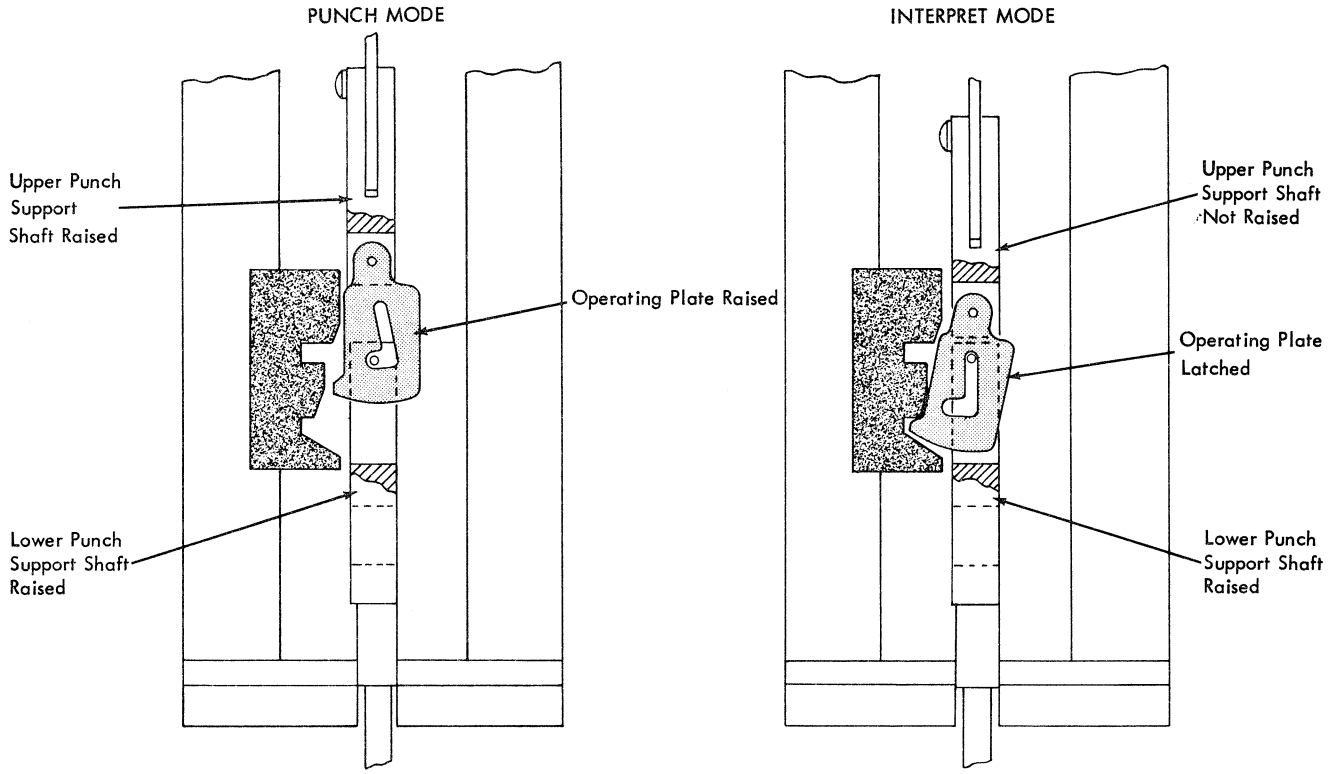


Figure 12-5. Lower Punch-Support Shaft (Raised)

solenoid armature is sufficient to overcome the spring tension at point A and force the transfer plate to shift. The transfer plate forces against all 12 operating plates, pivoting them about their pivot points C. The lower projection of the operating plate fits into the slot D (Figures 12-4 and 12-5). Pin B is now free to move in the operating slot E and, as the lower punch support is driven upward, no motion is transmitted to the punch.

Printing

The print interposers, whether punching or interpreting, move with the lower punch supports. Through this action, the code plate is positioned by spring tension, and normal printing takes place.

Circuit Operation (Reed Relay)

The circuits described in this section apply only to the interpreting operation on IBM 29 Model C reed-relay machines. For other circuits, refer to Field Engineering Theory of Operation Manual, *IBM 29 Card Punch*, Form 225-3358.

When two cards have been fed from the hopper and the punch/interpret switch is set to INTERPRET, all operations are automatic unless auto-feeding is interrupted (see Reed-Relay Wiring Diagrams):

1. Pick interpret relay and hold (Section 11A).
2. Deactivate print suppress (Section 14B).
3. Energize print sense magnet (Section 12B).
4. Energize punch suppress magnet (Section 12B).
5. Energize interposer magnet (Sections 2A and 2B).
6. Dummy cycle.
7. Print cycle.

When the punch/interpret switch is set to INTERPRET, the interpret relay (WCR2, Section 11A) is picked as soon as the card lever relays are not energized. The interpret relay is held through one of its own points (WCR2-9) until the switch is returned to PUNCH and the card lever drops, or until the machine is turned off. Dup 1 relays (114, 116, Section 10A) are picked by card lever voltage through a point (WCR2-6) of the interpret relay. A point of the interpret relay opens the circuit to the print-suppress magnet (Section 14B) from the print switch.

Dup 2 relay (122, Section 10A) is then picked and held by card lever voltage. Another point (WCR2-10) of the interpret relay allows the print-sense magnet (Section 12A) to be energized by P6 at 355° through 175° during each interpret pin-sense cycle (dummy punch cycle). The same point also holds the punch-suppress magnet (Section 12A), picked by CF5, and prevents punching from taking place. Another point (WCR2-1, Section 2B) of the interpret relay applies voltage to the interpret pin-sense contacts. Closing of these contacts, because of holes sensed in the card, causes interposer magnets to be energized by P5 at 86°. The unlatched interposers close the interposer bail contacts so that at 210° of the dummy cycle, the

circuit to the escape magnet (Section 10B) is completed by P1. When the escape armature contact closes (Section 11B), circuits are energized and cause the punch clutch to operate for a print cycle. The escape interlock (WCR1-1, Section 10B) prevents further escapement at this time. The interposers are latched on the punch bail, causing movement of the lower punch extensions, which then position the print interposers.

If no interposer magnets are actuated by sensing-pin contacts, an alternate circuit (WCR2-5 and 122-1, Section 9B) bypasses the interposer bail contacts and energizes the escape magnet.

Circuit Operation (Wire-Contact Relay)

The circuits described in this section apply only to the interpreting operation on IBM 29 Model C wire-contact relay machines. For other circuits, refer to Field Engineering Theory of Operation Manual, *IBM 29 Card Punch*, Form 225-3358.

When two cards have been fed from the hopper and the punch/interpret switch is set to INTERPRET, all operations are automatic unless auto-feeding is interrupted (see w/c Wiring Diagrams):

1. Pick interpret relay and hold (Section 8A).
2. Deactivate print suppress (Section 6B).
3. Energize print sense magnet (Section 6B).
4. Energize punch suppress magnet (Section 6B).
5. Energize interposer magnet (Sections 2A and 2B).
6. Dummy cycle.
7. Print cycle.

When the punch/interpret switch (7A, 8A) is set to INTERPRET, the interpret relay (26, Section 8A) is picked as soon as the card lever relay (24, Section 8A) is de-energized (24-6, Section 7A). The interpret relay

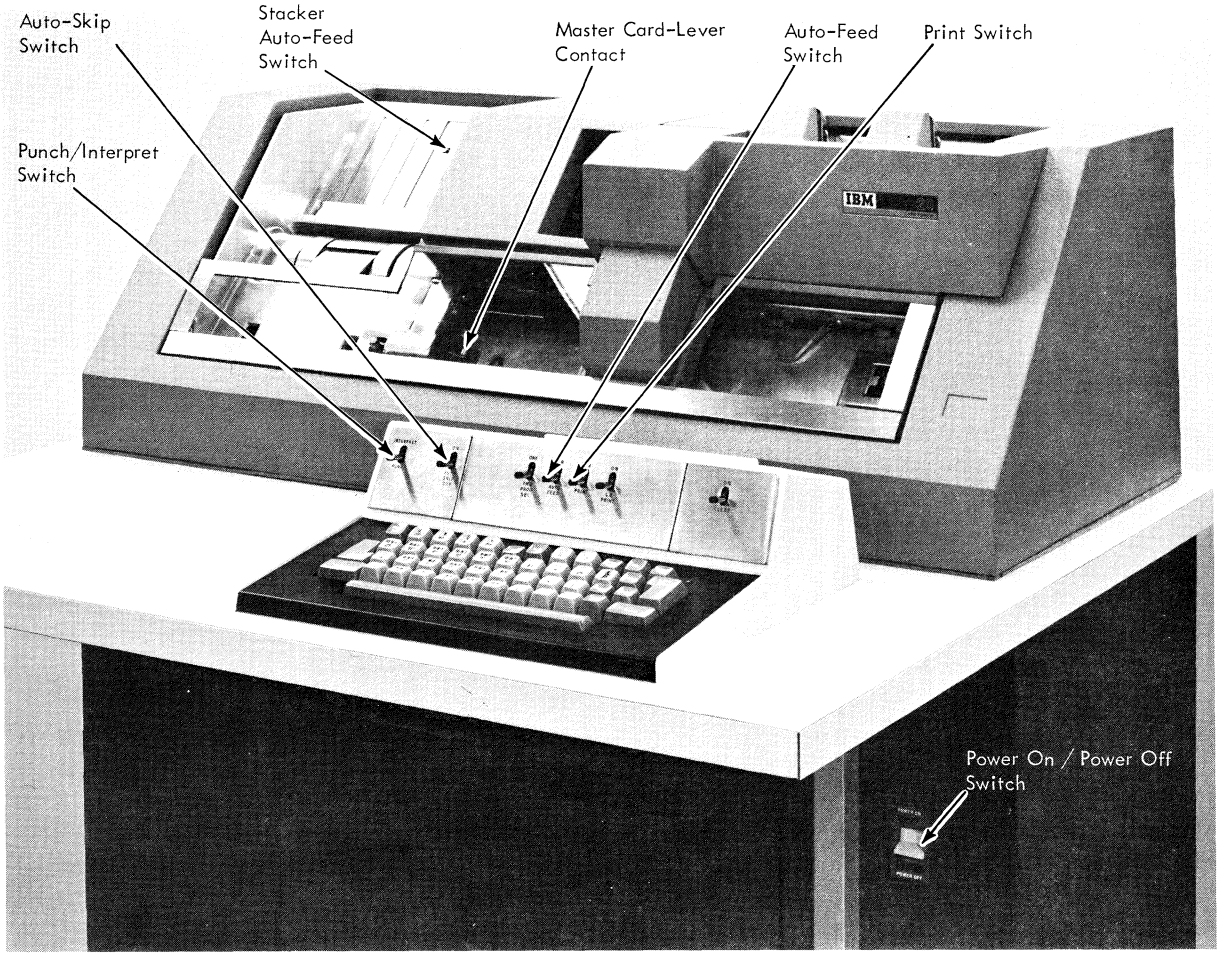


Figure 12-6. Switches and Contacts

is held through one of its own points (26-1) until the switch is returned to PUNCH and the card lever drops, or until the machine is turned off. Dup 1 relay (7, Section 8A) is picked by card lever voltage through a N/C point (26-4) of the interpret relay. A point of the interpret relay (26-9) opens the circuit to the print-suppress magnet (Section 6B) from the print switch.

Dup 2 relay (8, Section 8B) is then picked and held by card lever voltage. Another point (26-10) of the interpret relay allows the print-sense magnet (Section 6B) to be energized by P6 at 355° through 175° during each interpret pin-sense cycle (dummy punch cycle). The 26-12 point of the interpret relay holds the punch-suppress magnet (Section 6B), picked by CF5, and prevents punching from taking place. Point 7-1 (Section 2B) of the Dup 1 relay applies voltage to the interpret pin-sense contacts. Closing of these contacts, because of the holes sensed in the card, causes interposer magnets to be energized by P5 at 86°. Interpret relay points 26-3 (Section 8B) prevent picking the Dup 3 relay (4, Section 8B). The unlatched interposers close the interposer bail contacts so that at 210° of the dummy cycle, the circuit to the escape magnet (Section 12B) is completed by P1. When the escape armature contact closes (Section 9A), circuits are energized and cause the punch clutch to operate for a print cycle. Escape interlock relays 1 and 2 (9, 10, Section 10A) prevent further escapement at this time. The interposers are latched on the punch bail, causing movement of the lower punch extensions, which then position the print interposers.

If no interposer magnets are actuated by sensing-pin contacts, an alternate circuit (26-5, 19-5, 23-2, 23-3, and 10-4, Section 12A, 12B) bypasses the interposer bail contacts and energizes the escape magnet.

Switches, Keys, and Contacts

This section describes only the switches, keys, and contacts on the IBM 29 Model C that apply to or affect the interpreting feature of the Model C (Figure 12-6).

Power On/Power Off

The power on/off switch controls all power to the machine. Machine operation can be started immediately after this switch is turned on.

Feed Key

The machine starts operating when the feed key is pressed twice and the first two cards are fed from the hopper to the card bed. All other cards can be fed automatically by using the automatic-feed switch. Single cards are inserted manually and moved by pressing the feed key.

Auto Feed Switch

This switch must be on (with the stacker auto-feed switch) to permit the automatic feeding of cards. Two feed cycles are necessary before automatic feeding is available.

To stop the machine manually, turn off the auto-feed switch. To restart the machine, turn on the auto-feed switch and press the feed key or the release key. The release key can initiate an auto-feed cycle only when the read card lever contact is made while the machine is in the interpret mode.

NOTE: Card feeding is also under control of a card-lever contact mounted on the left master pressure rail. Auto-feeding is stopped if a jam occurs at the printing station during interpreting.

Punch/Interpret Switch

The punch/interpret switch on the keyboard controls the mode in which the machine is to operate.

This switch, when turned to PUNCH, provides normal IBM 29 Printing Card Punch operations. With the switch at INTERPRET, prepunched cards are interpreted, punching is suppressed, and the keyboard is locked.

Mode changes can only be made when no card is registered at the printing station. The new operation is started by transferring the switch and registering a card.

Each mode of operation is interlocked so that transfer between the modes takes place only between cards. Therefore, if the switch is transferred while a card is being processed, the change will not take place until the end of that card.

Stacker Auto-Feed Switch

This switch must be on (with the keyboard auto-feed switch) to permit the automatic feeding of cards. It is automatically turned off when the stacker is full. The machine is restarted by emptying the stacker and pressing the feed key.

Auto-Skip Switch

This switch, under program control, is operative when interpreting or punching. It is more efficient to auto-skip over a number of consecutive columns than to suppress interpreting. If the switch is off, interpreting continues through all fields programmed for skipping.

Print Switch

This switch controls normal IBM 29 printing in the punch mode. *Note:* In the interpret mode, this switch has no effect on machine operation.

Master Card-Lever Contact

The master card-lever contact has been incorporated to suspend auto card feeding should a jam occur at the print station while interpreting. The contact must be closed (with the stacker stop switch and the keyboard auto-feed switch) to permit automatic card feeding.

Power Supply

The power supply used in the IBM 29 Model C has a higher current rating than that of the standard IBM 29. A ferro-resonant supply is used for improved regulation in the Model C. Component layout is similar to that on the standard IBM 29.

DANGER

An ac voltage of several hundred volts appears on the resonant circuit.

Power: 115v, single phase, 60 cycle, 3.6 amperes
208v, single phase, 60 cycle, 1.9 amperes
230v, single phase, 60 cycle, 1.8 amperes.

Heat Dissipation: 720 BTU/hour.

Power Receptacle Requirements: B, H (115v)
C, K (208/230v).

Maintenance

Service Aids

This manual describes maintenance for only those parts of the IBM 29 Model C that are associated with the interpret feature:

Interpreting failures
Punch-suppression failures
Punching failures

Possible faults and causes for these failures are described in this section.

Detailed inspection of the punch unit cannot be made with the unit installed in the machine, but the following areas can be observed under operating conditions:

1. Solenoid plunger and bellcrank position.
2. Loosening of the screw retaining the leaf spring.
3. With the master station bed plate removed, the end of the transfer plate can be seen to determine its action. The bed plate may be removed without removing the sense unit.

The punch-drive unit anchor bar cannot be used as a means of adjusting punch penetration and/or printing to compensate for machine wear on the Model C. Penetration is restricted by a 0.047″ to 0.049″ adjustment. The areas of wear and the means of correction are:

1. Punch-Drive Unit: Replace the punch-drive unit parts showing wear, or replace the entire unit.
2. Printing Mechanism: Adjust the fixed stops on the vertical and horizontal print interposer slides, or replace the print mechanism parts.
3. Punch Blades and Punch Support Assemblies: Move the punch blade up to the next hole.

Interpreting Failures

Missing or incorrect characters because of sense-contact failures are caused by:

1. Incorrect sense-unit adjustments.
2. Sticking or bent pins.
3. Sense-pin holes in the punch stripper that are blocked by pieces of card. Grooves have been cut in card bed to assist in the removal of card particles. Use a thin, pointed or hooked, tool. Avoid forcing the particle down into the dust channel in the stripper.

CAUTION

When removing card jams at the print station, pull the cards toward the master station. Be careful in using probe-type tools to clear card jams; don't damage the sensing pins.

4. Faulty connections to sense unit magnet or contacts.

5. Dirty, bent, or broken sense contacts. No oil should be present on the contact assembly. Clean it if present.

6. Card skewing or other misregistration.

7. Faults in the punch drive or printing mechanism. (These will be apparent in punch mode also.)

Punch-Suppression Failures

See "Operational Check" for method of detecting complete or partial failure to transfer.

1. Incorrect punch-drive adjustments.
2. Low voltage or no voltage across the punch-suppression solenoid.
3. Incorrect solenoid bumper adjustments.
4. Solenoid not positioned in the same plane as the bellcrank, resulting in a sideways pull that causes binding.
5. Binding bellcrank.
6. Binding transfer plate shaft.
7. Binding operating plate.
8. Excessive transfer-plate return-spring tension.

Punching Failures

Complete or partial failure to punch is caused by:

1. Weak transfer-plate return spring.
2. Incorrect solenoid bumper adjustments.
3. Binding bellcrank.
4. Binding transfer-plate shaft.
5. Binding operating plate.

Incorrect Punch-Drive Adjustment

If punching failures or punch-suppression failures cannot be localized to other causes, the drive arms are not positioning the operating plates within the tolerance of 0.008". Only four courses of action are now possible:

1. Remake the anchor bar adjustment.
2. If not successful, alter the position of the punch drive-arm pivot shaft bushings.
3. Replace the set of 12-punch drive arms (see "Punch Drive Arm Replacements").
4. Replace the drive unit.

Preventive Maintenance

Installation Procedure

1. Remove the top cover and take out the shipping bolts that lock the bed in place.
2. Check the friction-drive gear train to be sure it is free from obstruction.
3. Lubricate the punch clutch.
4. Lubricate the punch-suppression unit.
5. Perform the operational check of the punch-suppression unit outlined in "Operational Check."
6. Inspect the unit for loose wires and relays.
7. Check belts for ¼-inch deflection midway between the pulleys.
8. Compare the voltage rating on the machine with the source voltage to be used.
9. Check the container to see if the special CE tools necessary for maintenance of this feature are available:

   Part 361730, 0.047"-0.055" slip gage
   Part 361732, 0.049"-0.055" slip gage
   Part 338499, Sense pin alignment tool

Protect the edges of these precision tools from damage and be careful not to bend them. Keep them wrapped in a lightly oiled cloth.

Maintenance Routine

The standard IBM 29 scheduled maintenance applies also to the IBM 29, Model C. Additional service requirements for the Model C are included in Figure 12-7.

If the punch-suppression mechanism is removed from the machine for any reason, clean and lubricate it, and then check it as in "Home Position Definition."

Lubrication

All components of the punch-suppression mechanism must be well lubricated and free moving. Lubricate the mechanism linkage carefully at each scheduled maintenance call and whenever the punch-suppression mechanism is removed from the machine for any reason. Lubricate the upper punch supports whenever they are accessible. *Be sure that oil does not run into the solenoid.*

By removing the plastic bed plate and tilting the base, it is possible to run oil down a screwdriver blade and lubricate the bellcrank arm pivots and the left side of the punch-suppression mechanism.

Punch Support Mechanism: Lubricate the working parts lightly with IBM 6. Operate the punch-suppression mechanism to spread the oil along the shaft and into the bushing. *Do not allow oil to run into the solenoid.*

Pin Sensing Unit: Do not lubricate.

Code	Unit or Routine	Freq. (wks)	Lubricate-Clean	Observe
6	Punch Suppress Unit	52	Lubricate the transfer plate and shaft, operating plate pivot pins, lower punch support pins, solenoid bell crank and bell crank arm pivots. Clear card dust and chips from the punch station pressure roller, and from the slots in the punch stripper.	Check connections to sense unit. Check for free movement of sensing pins and punch suppression mechanism. Check condition of moving contacts.
1	Feed		Clean moving parts and base. Lubricate gears, cams, pivots, bearings, oil wicks, motor and friction drive.	Check for worn belts, linkages, cams, and bearings.
2	Print			
3	CB	52		
4	Punch			
5	Drive			

Cleaning and lubrication of special features or other additional electro-mechanical devices should be scheduled with basic scheduled maintenance.

Lubricate punch clutch and clear card dust from the slots in the punch stripper in conjunction with 01 calls.

Test the operation of the punch suppression unit and general machine operation after completing each scheduled maintenance call.

Figure 12-7. Preventive Maintenance Routine

Operational Check

The operational check of the punch-suppression mechanism must be made before the machine is released for customer operation. Do this to make sure holes are not repunched, creating dust or off-registration.

Check correct operation of the punch-suppression mechanism, by the following method, after each maintenance call involving the punch-suppression mechanism or circuits, and according to the preventive maintenance schedule.

1. Turn the auto-feed switch off, and turn the interpret/punch switch to PUNCH.
2. Punch the first card with all keyboard characters.
3. Turn machine power off.
4. a. Reed-relay machines:
   Move the wire in WCR2-1 N/C to WCR2-1 N/O.
   b. Wire-contact relay machines:
   Remove Dup 3 relay (R4).
5. Turn the machine on, and turn the interpret/punch switch to INTERPRET.
6. Register the punched card at the read station and register a blank card at the punch station. Observe that the pin-sensed information is printed on the blank card and that no holes are punched.
7. Turn off machine power and replace the wire moved in step 4.

It is possible for the coil of the punch-suppression solenoid to be open-circuited without being detected during machine operation. Carry out this operational check regularly, to be sure punching is suppressed.

Checks, Adjustments, and Removals

Interpret Sensing Unit

Adjustments

The following adjustments can be checked and made with the pin-sense unit (Figure 12-1) installed in the machine. Check all sensing-unit adjustments with power applied.

1. Turn the main-line switch off.
2. Using a strip of card, insulate cam P7 which is closed at latch time.
3. Place a blank card between the die and the stripper.
4. Turn on the interpret switch and the main-line switch.
5. Turn off the motor switch.
6. Release the punch clutch and turn the index to 10°. This puts a 50 ohm resistor across P7 in series with P6. As a result, about 18 volts are applied to the pin-sense magnet.
Do not turn the punch index to P5 time (86° to 166°) during this procedure as this would energize all interposer magnets.
7. Check for a clearance of 0.12" between the armature and the core (Figure 12-8). Use three strips of card cut to approximately ⅛ inch as a gage. Two strips should go with no drag; three strips should have a slight drag. Loosen the four mounting screws, and shift the magnet to obtain this adjustment. If the magnet location is changed, recheck both the 12- and the 9-ends. It is possible to check the 12-end through the print-unit area.

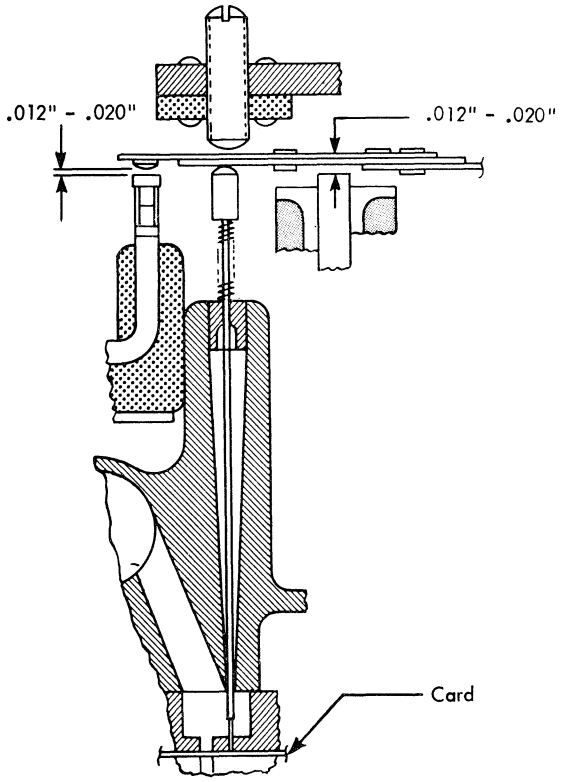


Figure 12-8. Pin-Sense Unit — Blank Card

8. Check for 0.012″ to 0.020″ air gap on all contacts (Figure 12-8). Two cards cause no drag; three cards cause slight drag. Loosen the two mounting screws and shift the contact molding assembly to accomplish this adjustment.

9. Remove the blank card and turn the main-line switch on and off intermittently (about 18 volts applied to the sensing magnet). The contacts must fully operate at this voltage. If any failures occur, remove the contact assembly and form the failing contact downward. As a final check, with the power off, measure the contact tension with a gram gage. The contact strap should move away from the adjusting screw with a minimum of 22 grams tension (Figure 12-9).

10. With the power still off, remove the card insulating P7 and turn on the motor switch.

11. Remove the card. Turn the power on momentarily. The contact-spring assembly should have a visual air gap from the armature when the armature is held on the core. This ensures correct wiping action (Figure 12-10). Relieve the tension in the contact spring if the air gap is not present.

12. The sensing pins must be inside the lower face of the die when the armatures are not attracted (Figure 12-3). Use the thickest feeler gage possible between the die and the stripper without creating excessive drag. Run down the top adjusting screw until the

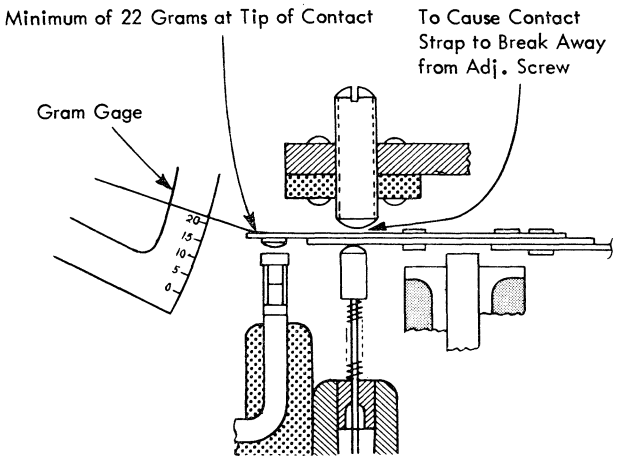


Figure 12-9. Contact Tension

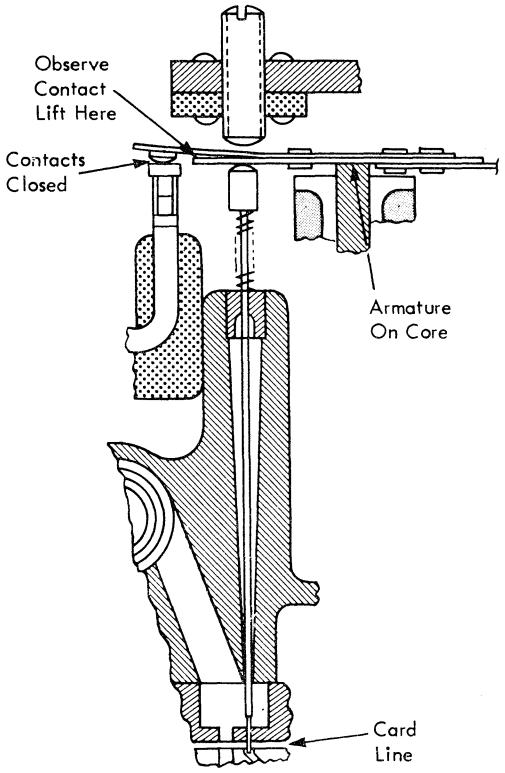


Figure 12-10. Pin-Sense Unit — Hole Sensed

sensing pin just contacts the feeler gage. Back off the screw ¼ turn.

13. Run a card through the machine in the interpret and punch modes to check for correct operation.

Removal

The sensing unit and the punch unit cannot be independently interchanged or replaced. Each punch die and stripper is matched to a sensing casting during manufacture.

For example, replacing the sensing unit makes it necessary to replace a matched punch unit; conversely,

replacing the punch unit makes it necessary to replace a matched sensing unit. However, any component part of these units can be replaced except:

Sensing Casting, part 594118, in the sensing unit.

Die, part 594116, in the punch unit.

Die Guide Casting, part 594122, in the punch unit.

Note that the punch drive arms must be replaced in matched sets (B/M 5404032).

1. Loosen the screws holding the sensing unit top plate. Slide the sensing-pin aligning tool over the heads of the sensing pins between the pins and the armatures. The tool aligns the sensing pins to make replacement of the sense unit possible.

2. Loosen the wire ribbon guides.

3. Remove the three screws holding the sensing unit.

4. Ease the sensing unit away from the die. Make every attempt to lift the unit straight up to avoid damage to the tips of the sensing pins.

Replace in the reverse order, with the sensing-pin aligning tool in place. Do not damage the sensing pins.

Master Card Lever Contact

Adjustments

The following adjustments are similar to those for the standard IBM 29:

1. Adjust the card lever arm (pressure rail) to exert a force of 23 to 27 grams on a card in the master bed (Figure 12-11).

2. With this adjustment made, the pressure rail should rest against the bed plate when no card is in the master station.

3. Obtain a contact air gap of 0.015″ to 0.020″ by forming the stationary strap.

4. Check for a 0.025″ minimum contact rise with a card in the master bed.

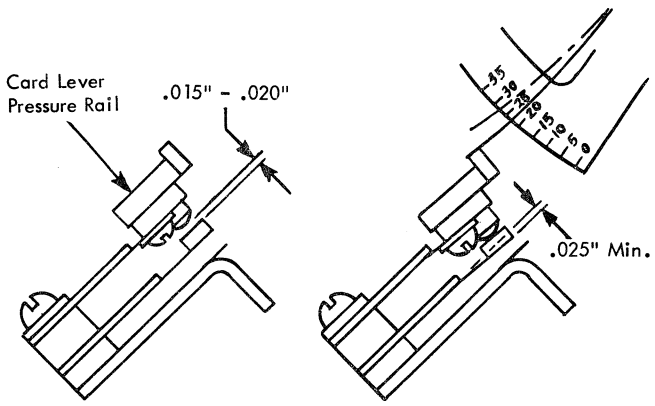


Figure 12-11. Master Card Lever Contact

Pressure Roll Opening (Punch Station)

Adjustment

The feed-wheel clearance of 0.025″ to 0.035″ on the standard Model C machine, and 0.035″ to 0.040″ on the Model C with high-speed skip, cannot be checked from the left side of the punch die and stripper. Insert the feeler gage from the right side of the punch die and stripper.

Punch Unit and Punch Support Assembly

Home-Position Definition

The home position of the punch support arms is defined as that position at which the punch drive unit is latched and the punch supports are at their lowest limit of travel. The punch-suppression mechanism is designed to operate correctly around tolerable differences of the home position of the punch supports. (The approximate home position can be set by using slip gages. Refer to "Punch Unit Removal.")

If the punch-drive unit is removed or if its fixed location changes, the punch supports must be returned to within approximate home position.

Proper adjustments to the home position of the punch unit and the punch drive unit are critical for correct machine performance. Because of the related mechanical linkage between these units, any adjustment to the home position of the punch drive arms will affect the home position of the punch supports.

The punch-suppression mechanism adjustments ensure that the operating plates will transfer completely when the machine is in the interpret mode. The operating plates must latch fully into the mounting plate (Figures 12-5 and 12-12) to ensure that the pin in the lower punch support has free movement in the operating plate vertical slot.

The vertical positions of the operating plates are determined directly by:

1. The horizontal alignment of the punch drive arms, and

2. The drive arm positions set by the anchor bar adjustment.

To permit all the operating plates to latch fully into the mounting plate at the same time, the mounting plate slot has been designed wide enough to permit a maximum vertical displacement of 0.008″ between the highest and lowest operating plates (Figure 12-13).

Because the operating plate is positioned vertically by the punch drive arms, the horizontal alignment of the drive arms must be held within 0.008″. In practice, the drive unit for the IBM 29 Model C is manufactured to hold the alignment of the punch drive arms within 0.006″. These are much closer tolerance limits than are necessary for other models of the IBM 29. This

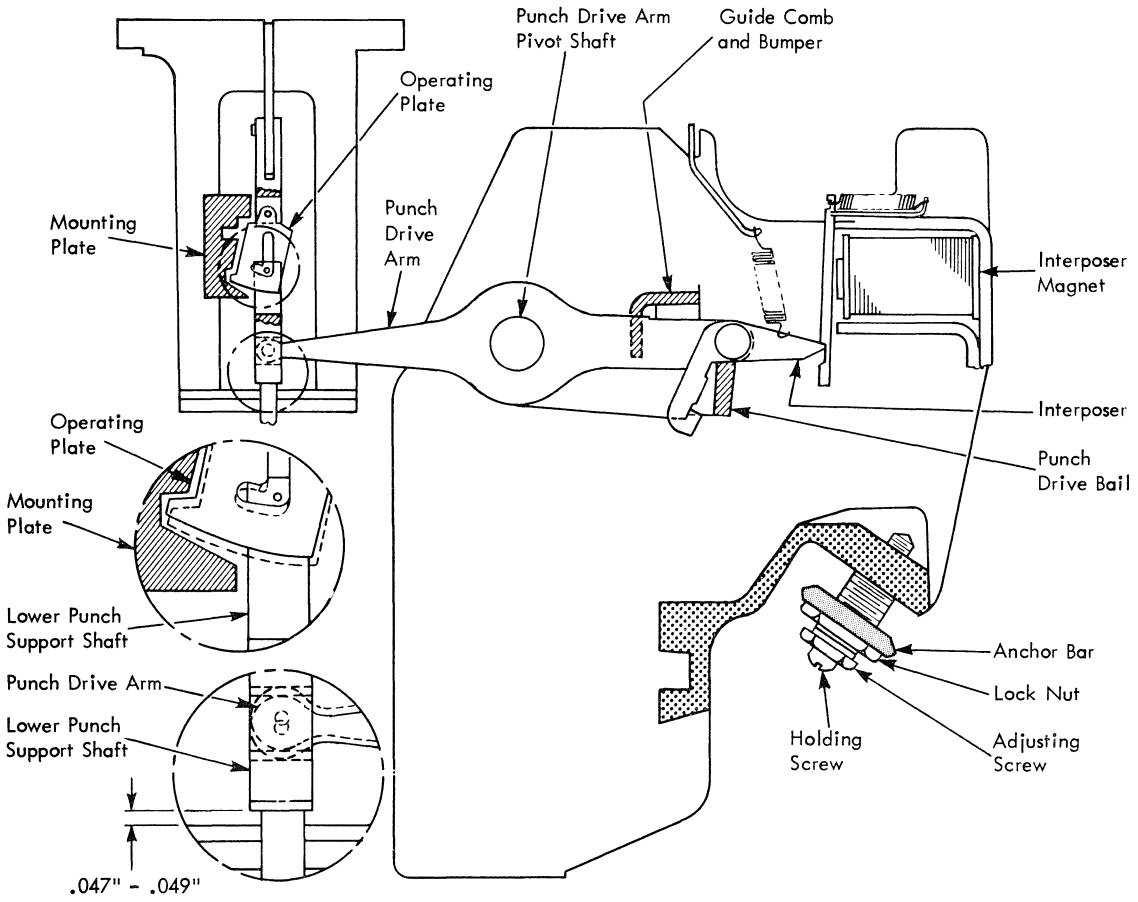


Figure 12-12. Punch Drive Arm

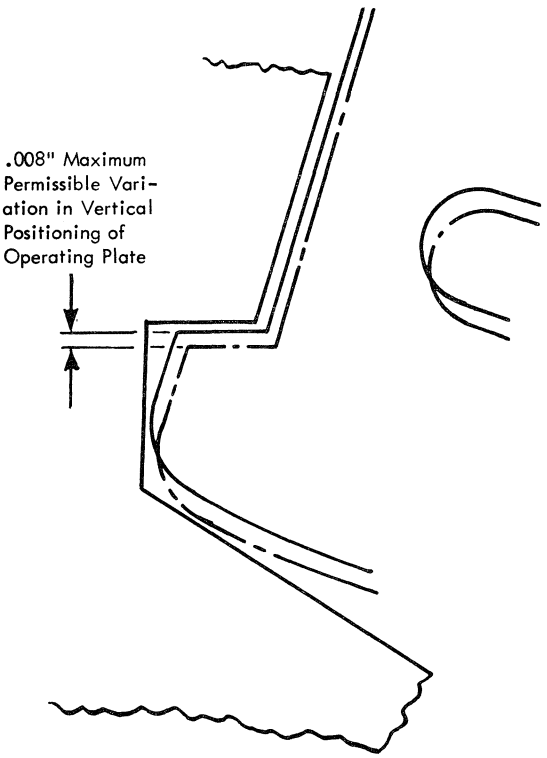


Figure 12-13. Operating Plates Latched

leaves 0.002″ in which to set the anchor bar adjustment.

Do not attempt to energize the punch-suppress solenoid when the machine is operating (manually or auto-duplicating) in punch mode.

Punch Unit Adjustments

No adjustments can be made with the punch unit installed in the machine. Assemble the major punch unit with the punch support guide plate and code-position frame casting, before checking the following adjustments. Adjust in the following sequence:

1. Push the punch support assemblies upward. Insert the 0.047″ side of gage 361730 between the supports and the guide plate. Return the supports to rest firmly on the gage. At this point, check to be sure that the toes of the operating plates latch into the slot on the mounting plate when the punch-suppression solenoid is manually attracted and movement is stopped by the transfer plate. (Figures 12-5, 12-12, and 12-13). Repeat this procedure using the 0.055″ side of gage 361730. If this condition cannot be met, adjust the mounting plate assembly (Figure 12-4).

2. Check carefully that the operating plates can be freely moved by means of the transfer plate. *Any indi-*

cation of the slighest bind must be investigated and corrected.

3. With the operating plates in the interpreting position, check that the lower parts of the punch-support assemblies can operate freely in the vertical slots of the operating plates.

4. With the punch-suppress solenoid manually operated, adjust for 0.001″ to 0.005″ clearance between the solenoid plunger collar and the lower solenoid bumper by repositioning the solenoid.

5. Check that the return spring has an operating force of 400 to 500 grams. Remove the return spring and re-form to obtain correct tension. The solenoid must be de-energized when the operating force is measured. Use a formed paper clip or a similar device and ten times blade on the CE gram gage.

6. Operate the solenoid plunger manually and check to see that the transfer plate fully returns the operating plates to home position.

7. Reinstall the punch unit in the machine and connect the punch drive-unit operating arms to the punch supports. Install the loading springs and nuts on the punch supports.

8. Latch the punch clutch, loosen the two screws in the pin-bail drive link, and loosen the punch drive-unit and anchor-bar adjustment. Push all punch-support assemblies upward against the punch operating arms to take up the slack. Insert gage 361730 between the punch supports and the punch drive-arm guide comb with the 0.047″ side of the gage under the step of the punch supports (Figures 12-12 and 12-4). Adjust the drive-unit anchor bar until the gage is gripped lightly by the lowest punch support. Lock down the anchor bar. Remove the gage and attempt to insert the 0.049″ side of gage 361732. It must not pass under any punch supports, except with extreme drag. Repeat this procedure until this condition is met.

NOTE: This procedure replaces punch penetration and the 0.015″ to 0.020″ interposer-yokes to print-interposer-guide-plate clearance used on the standard IBM 29.

Make an operational check of the punch-suppression mechanism before returning the machine to the operator.

Punch Unit Removal

Before removing the punch unit carefully check all other possible trouble causes and be thoroughly familiar with information in this manual. Lubricate the punch unit carefully whenever it is removed from the machine for any reason.

1. Remove the sensing unit.

2. Remove the vertical-drive-rod guide plate. Remove the cover interlock switch and the mounting bracket.

3. Remove the print unit and the print ribbon. Refer to "Print Unit Removal" in Field Engineering Maintenance Manual, *IBM 29 Card Punch*, 225-3357.

4. Remove the punch extension cover, nuts, and springs. On reassembly, do not force the nuts tightly against the shoulder, for this can cause the extension to break off.

5. Loosen the punch-suppress solenoid unit top mounting screw located under the card feed. Do *not* loosen the two outer screws holding the solenoid mounting plate to the print interposer assembly or the two screws holding the solenoid yoke to the mounting plate. The solenoid adjustments will be retained if the solenoid assembly and print interposer assembly are removed and replaced as a unit. If the screws holding these two assemblies are loosened, the solenoid bumper adjustments must be remade.

Should it be absolutely necessary to remove the solenoid plate assembly, scribe the location marks of the plate on the code positioning casting and the punch support casting. Accurate scribe marks will enable you to relocate the solenoid plate assembly without losing the critical clearance of the solenoid to the bumper.

6. Remove the four mounting screws and pull the print interposer assembly and punch-support guide plate from the punch extensions. Keep the horizontal shift slide compressed to prevent displacement of the interposer and rollers. A rubber band can be used for this purpose.

7. Remove the eject unit, master-station upper plastic guide, master and detail station pressure-rail covers, and master-station bed plate.

8. Remove the two screws holding the punch unit in place. Disengage all punch drive arms from the punch support arms. Take the unit out from the top of the machine.

Punch Unit Replacement

Replace by reversing the steps used for removal.

When reversing step 7: to retain the solenoid bumper adjustments, the two screws holding the solenoid mounting plate to the print interposer assembly are not loosened. Replace the punch support guide plate, and then replace the print-interposer assembly and the solenoid assembly as a unit. Note that if the two assemblies have been separated, the solenoid bumper adjustments must be remade. Make sure that the solenoid assembly locates correctly on the pin of the transfer plate shaft.

Make sure that the punch drive-arm guide comb does not cause the drive arms to bind against the lower punch supports.

Set up the code-plate alignment as for standard card punches.

Punch Support Assembly Removal

1. Remove the punch unit.
2. Remove the lower guide plate.
3. Remove the retaining pin plate.
4. Remove the retaining pin.
5. Remove the punch support assembly.
6. Remove the punch.

Replace in reverse order. Make sure that the extensions run freely in their guides. Also, make sure the transfer plates operate freely.

Punch Drive Arm Replacement

Do not replace drive arms individually.

Correct functioning of the punch-suppression unit can be obtained only by maintaining close (manufacturing) tolerances in the drive unit. For this purpose, a matched set of 12 drive arms complete with pivot shaft and bail (part 5404032) should be installed when a punch drive arm has to be replaced.

Removal and replacement procedure is the same as for the standard IBM 29.

Armature Assembly

Removal

1. Remove the sense-magnet terminal block.
2. Loosen the three mounting screws.
3. Insert the sensing-pin aligning tool over the heads of the sensing pins.
4. Remove the three mounting screws, the contact-adjusting screw mount, and the contact assembly.

Replacement

1. Make sure all the pins are aligned by using the aligning tool.
2. Install the contact assembly, the contact-adjusting screw mount, and install (loosely) the three mounting screws.
3. Press the contact-adjusting screw mount to ensure that the sensing pins are in their guides. *Do not force the pins into the guides with the mounting screws.*
4. With the pins in the guides, remove the aligning tool, and tighten the three mounting screws.
5. Check each contact strap individually to make sure that no pins are binding in their guides.

Appendix A. Special Feature Compatibility

The special features described in this manual provide additional flexibility for applications requiring special handling on the IBM 29 Card Punch. These special features are compatible in groups as shown in the following chart:

Feature	Model A						B		C	
Variable Length Card Device	X		X	X			X		X	
Interspersed Gang Punch		X			X	X		X		X
Auxiliary Duplication	X	X	X		X		X	X	X	X
High Speed Skip	X		X	X			X		X	
Character Inhibit	X	X	X	X	X	X	X	X	X	X
Mutilated Card Feed	X	X	X	X	X	X	X	X	X	X
Reading Board Extension	X	X	X	X	X	X	X	X	X	X
Card Lifter	X	X	X	X	X	X	X	X	X	X
Master Card Insertion		X			X	X		X		X
SC Modulus 10	X	X								
SC Modulus 11				X		X				
SC Number Generator	X	X		X		X				

Appendix B. Wiring Diagrams

NAME	SECTION	PART NO.	LOGIC NO.	PAGE
Power Supply 50 Cycle (Mod C)	———	5373567	00.29.01.1	B-3
Power Supply 60 Cycle (Mod C)	———	5373568	00.29.01.1	B-4
Character Inhibit Feature	1	5462479	———	B-4A
Numeric Keyboard and Interposers/Aux Dup (Mod A)	1, 2	5373564	00.29.02.1	B-5
Numeric Keyboard and Interposers/Aux Dup (Mod B)	1, 2	5404279	01.29.02.1	B-6
Numeric Keyboard and Interposers (Mod C)	1, 2	5404101	02.29.02.1	B-7
Numeric Keyboard and Interposers/Aux Dup (Mod C)	1, 2	5404102	02.29.02.1	B-8
Numeric Keyboard and Interposers (Self-Check Mod 10 & 11)	1, 2	5400965	03.29.02.1	B-9
64-Character Keyboard	3, 4	5373554	00.29.03.1	B-10
Card Feed, MP, Clear, Release/MCI (Mod A)	5, 6	5373562	00.29.04.1	B-11
Card Feed, MP, Clear, Release/MCI (Mod B)	5, 6	5404271	01.29.04.1	B-12
Card Feed, MP, Clear, Release (Mod C)	5, 6	5404103	02.29.04.1	B-13
Card Feed, MP, Clear, Release/MCI (Mod C)	5, 6	5404110	02.29.04.1	B-14
Card Feed, MP, Clear, Release (Self-Check Mod 10 & 11)	5, 6	5400967	03.29.04.1	B-15
Card Feed, MP, Clear, Release/MCI (Self-Check Mod 10 & 11)	5, 6	5400968	03.29.04.1	B-16
Keyboard Restore/MCI (Mod A)	7, 8	5373563	00.29.05.1	B-17
Keyboard Restore, Prog Sel, Cd Lev/ MCI (Mod B)	7, 8	5404272	01.29.05.1	B-18
Keyboard Restore (Mod C)	7, 8	5404108	02.29.05.1	B-19
Keyboard Restore/MCI (Mod C)	7, 8	5404113	02.29.05.1	B-20
Keyboard Restore (Self-Check Mod 10 & 11)	7, 8	5400969	03.29.05.1	B-21
Keyboard Restore/MCI (Self-Check Mod 10 & 11)	7, 8	5400970	03.29.05.1	B-22
Escape Magnet, Dup, Skip/VLC (Mod C)	9, 10	5404104	02.29.06.1	B-23
Escape Magnet, Dup, Skip/VLC (Self-Check Mod 10 & 11)	9, 10	5400971	03.29.06.1	B-24
Punch Clutch/HSS (Mod A)	11, 12	5373570	00.29.07.1	B-25
Punch Clutch, Esc Intlk, Alpha/HSS (Mod B)	11, 12	5404277	01.29.07.1	B-26
Punch Clutch (Mod C)	11, 12	5404105	02.29.07.1	B-27
Punch Clutch/HSS (Mod C)	11, 12	5404276	02.29.07.1	B-28
Punch Clutch (Self-Check Mod 10 & 11)	11, 12	5400972	03.29.07.1	B-29
Punch Clutch/HSS (Self-Check Mod 10 & 11)	11, 12	5404278	03.29.07.1	B-30
Print Feature (Mod C)	13, 14	5404106	02.29.08.1	B-31
Interspersed Gang Punch	15, 16	5373569	00.29.08.2	B-32
Aux Drum Prog Sensing Cont (Self-Check Mod 11)	17, 18	5400973	03.29.09.1	B-33
Self-Check Mod 11	19, 20	5400974	03.29.10.1	B-34
Self-Check Mod 10	19, 20	5400975	03.29.10.1	B-35
Self-Check Mod 11	21, 22	5400976	03.29.11.1	B-36
Self-Check Mod 10	21, 22	5400977	03.29.11.1	B-37
Self-Check Non-Gen Mod 11	23, 24	5400978	03.29.12.1	B-38
Self-Check Gen Mod 11	23, 24	5400979	03.29.12.1	B-39
Self-Check Gen Mod 10	23, 24	5400980	03.29.12.1	B-40
Location Chart (Mod C)	———	5404107	02.29.09.0	B-41
Keyboard VLCD & Cam Reference (Mod C)	———	5404109	02.29.10.0	B-42
Location Chart (Self-Check Mod 11)	———	5400981	03.29.13.0	B-43
Location Chart (Self-Check Mod 10)	———	5400982	03.29.13.0	B-44
Self-Check Mod 10	———	5400983	03.29.14.0	B-45
Self-Check Mod 11	———	5400984	03.29.14.0	B-46

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W/C Auxiliary Duplication (Aux Dup)	———	5405965	———	B-47
W/C Master Card Insertion (MCI)	———	5405966	———	B-48
W/C Interspersed Gang Punch (IGP)	———	5405967	———	B-49
W/C High Speed Skip (HSS)	———	5405968	———	B-50
W/C Variable Length Card Device (VLCD)	———	5405969	———	B-51
W/C Self-Check Mod 10 and 11 Numeric Keyboard, Interposer Magnets, Pin Sense	1, 2	5405919	———	B-52
W/C Character Inhibit Feature	1	5462478	———	B-52A
W/C Mod C Numeric Keyboard, Interposer Mag, Pin Sense and Print Sense	1, 2	5405972	———	B-53
W/C Mod A, B, C, 10 and 11 64 Character Keyboard	3, 4	5405944	———	B-54
W/C Self-Check Mod 10 and 11 Card Feed, Prg Select, Print	5, 6	5405920	———	B-55
W/C Mod C Card Feed, Program Select, Print, Interpret	5, 6	5405973	———	B-56
W/C Self-Check Mod 10 and 11 Dup, Clear, Release, Card Lever	7, 8	5405921	———	B-57
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W/C Self-Check Mod 10 and 11 Punch Clutch, Multi Pch, Alpha, Keyboard Restore	9, 10	5405922	———	B-59
W/C Mod A and C Punch Clutch, Multi Pch, Alpha, Keyboard Restore	9, 10	5405914	———	B-60
W/C Self-Check Mod 10 and 11 Skip, Escape Magnet	11, 12	5405923	———	B-61
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W/C Self-Check Mod 10 Multiplier	13, 14	5405930	———	B-63
W/C Self-Check Mod 11 Multiplier	13, 14	5405924	———	B-64
W/C Mod C +48 Volt Net	13, 14	5405976	———	B-65
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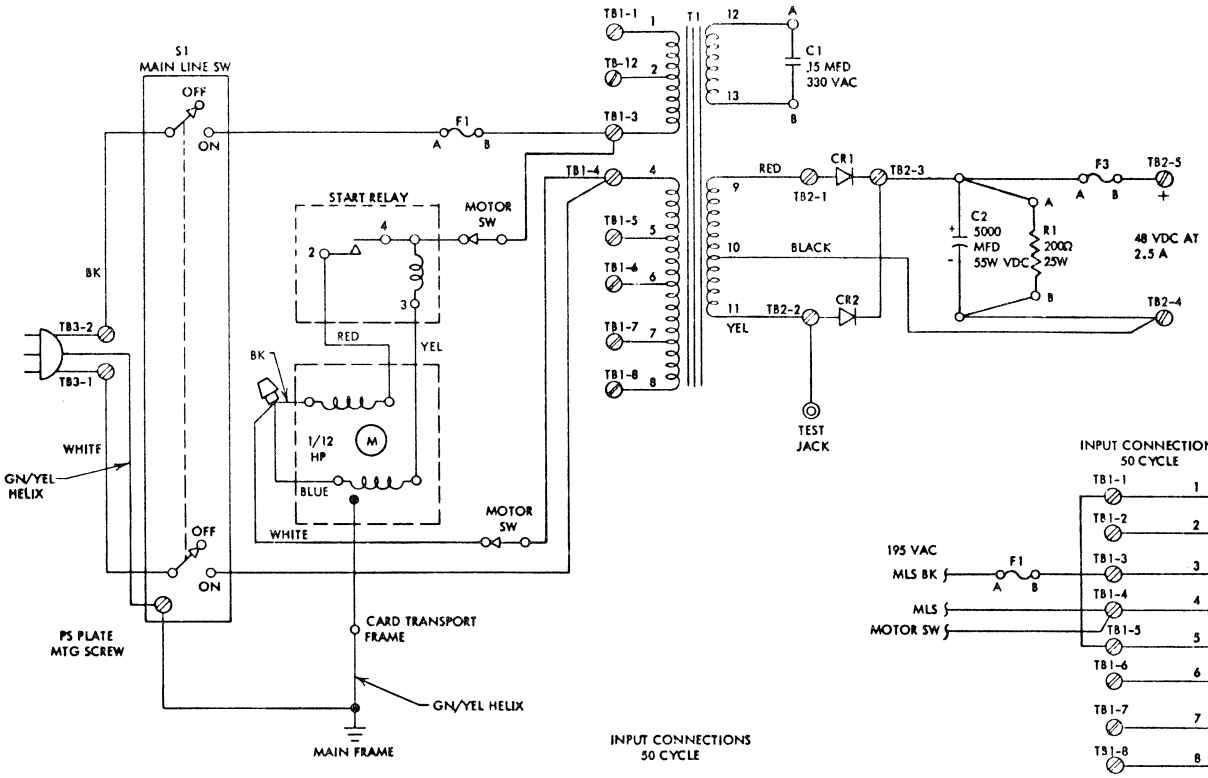
W/C Self-Check Mod 10 Component Location (Sheet 2 of 2)	23, 24	5405928	———	B-74
W/C Self-Check Mod 11 Component Location	23, 24	5405929	———	B-75

5373567

00.29.01.1

POWER SUPPLY 50 CYCLE
48V AT 2.5A POWER SUPPLY

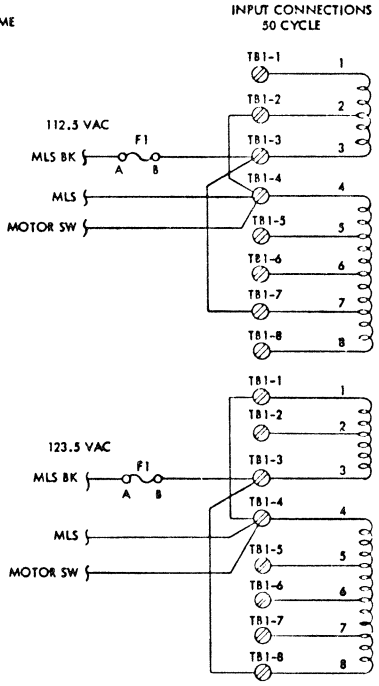


NAME	PART NUMBER
T1	5404096
C1	1143069
C2	208222
CR1 2A	5404082
CR2 2A	5404082
R1	221110
S1	5372190

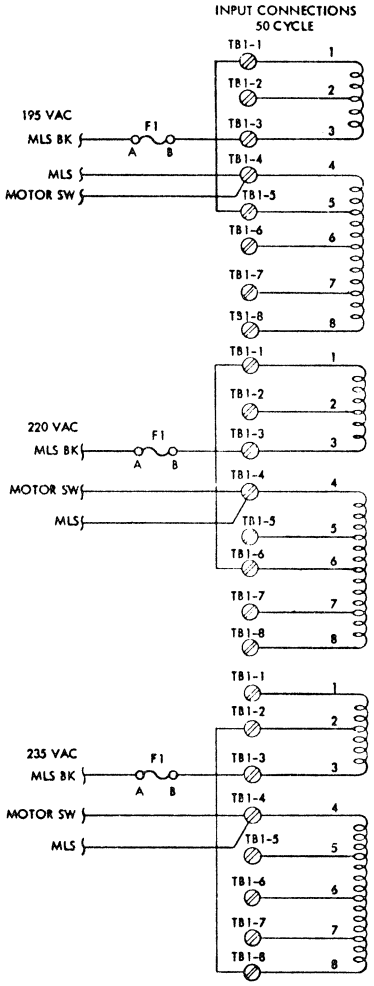
LONG TIME LAG FUSE			
	AMPS	PART NO.	VOLTS AC
F1	4.0	107665	112.5
F1	4.0	107665	123.5
F1	2.0	92734	195
F1	2.0	92734	220
F1	2.0	92734	235

FUSE	AMPS	PART NO.	VOLTS DC
F3	3	6324	48

INPUT CONNECTIONS
50 CYCLE



INPUT CONNECTIONS
50 CYCLE



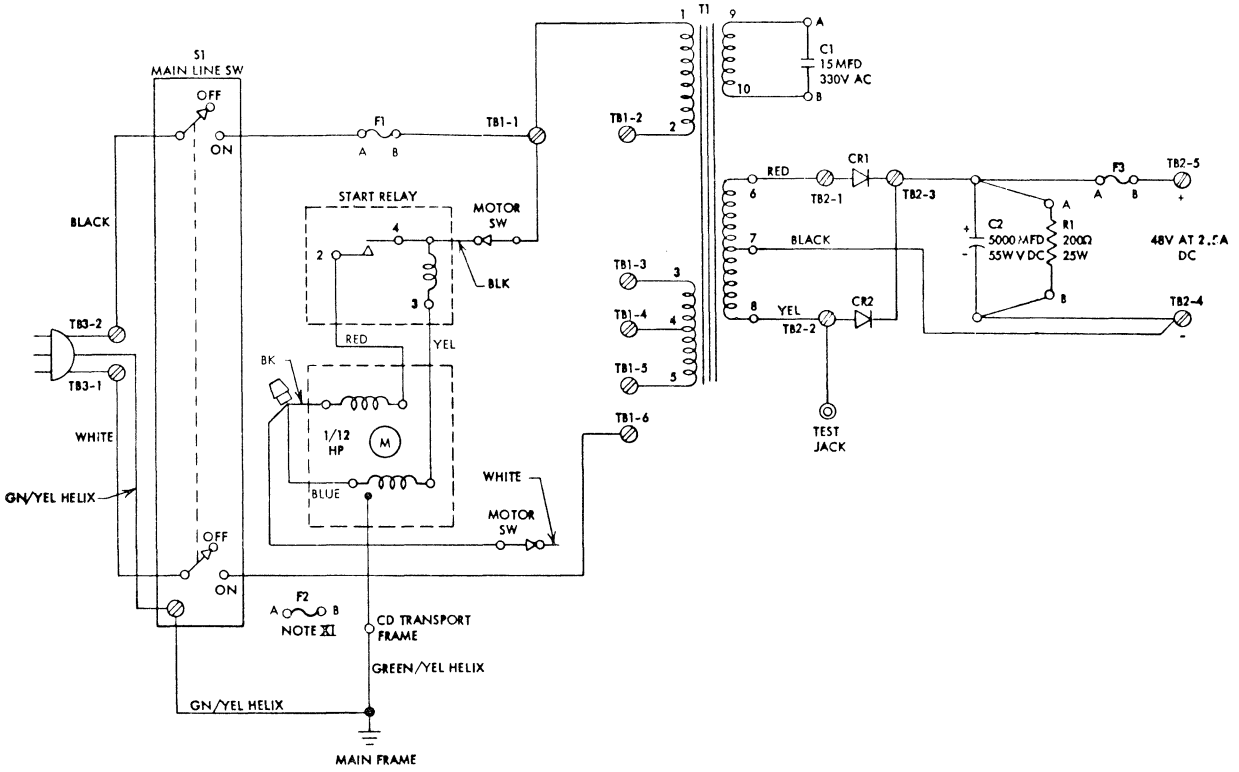
INTERNATIONAL BUSINESS MACHINES CORP.							DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	WIRING DIAGRAM						6-8-65	205329			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	WT	5-4-65	MODEL				11 MAR 66	205542				
DETAIL												
CHECK	LF	5-4-65	DRAW	idl	4-30-65							00.29.01.1
APPRO	RLJ	5-4-65	CHECK									

5373567

5373568

00.29.01.1

POWER SUPPLY 60 CYCLE
48V AT 2.5A POWER SUPPLY

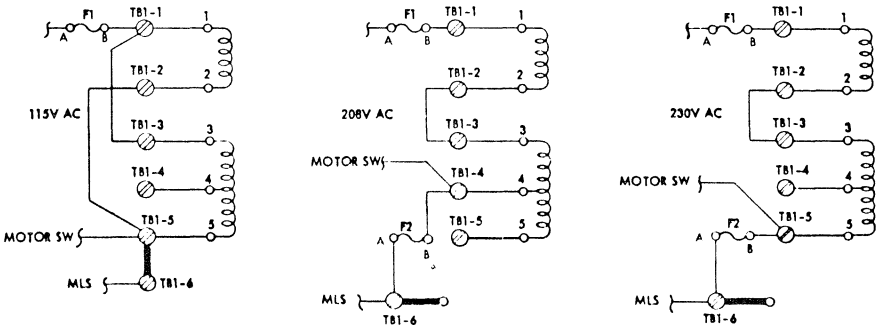


NAME	PART NO.
T1	5404091
C1	1143069
C2	208222
CR1 2A	5404082
CR2 2A	5404082
R1	221110
S1	5372190

LONG TIME LAG FUSE			
	AMPS	PART NO.	VOLTS AC
F1	4.0	107665	115
F1	2.0	92734	208
F1	2.0	92734	230
F2	2.0	92734	208
F2	2.0	92734	230

FUSE	AMPS	PART NO.	VOLTS DC
F3	3	6324	48

INPUT CONNECTIONS 60 CYC

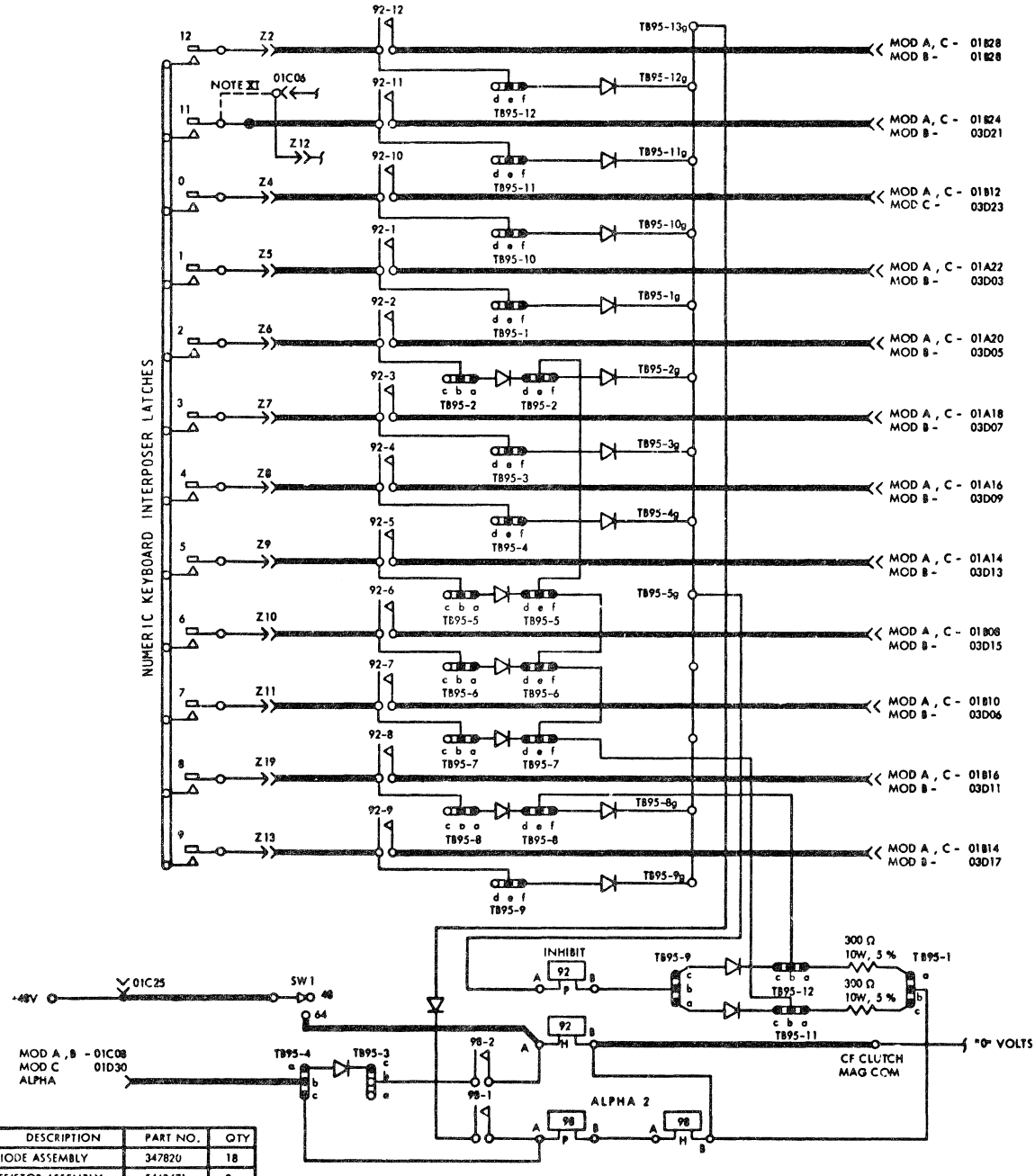


NOTES

X1 FOR 115V OPERATION F2 WILL NOT BE USED

INTERNATIONAL BUSINESS MACHINES CORP.													
NAME	WIRING DIAGRAM					DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.	5373568
	48V DC AT 2.5A					6-6-65	205329			X PRINT TO ENG. SPEC. NO.		
DESIGN	WT	5-4-65	MODEL			11 MAR 66	205542			895291		
DETAIL												
CHECK	LF	5-4-65	DRAW	Idl	4-30-65						00.29.01.1	
APPRO	RLJ	5-4-65	CHECK									

W/D - IBM 29 - CHARACTER INHIBIT FEATURE
REED RELAY



DESCRIPTION	PART NO.	QTY
DIODE ASSEMBLY	347820	18
RESISTOR ASSEMBLY	5462471	2
RELAY, R92	255735	1
RELAY, R98	196208	1

NOTES
XI REMOVE INT. 11 CONN FROM 1C06 AND CRIMP TO FEATURE NO. 15 USING SLIP-ON CONN P/N 596255

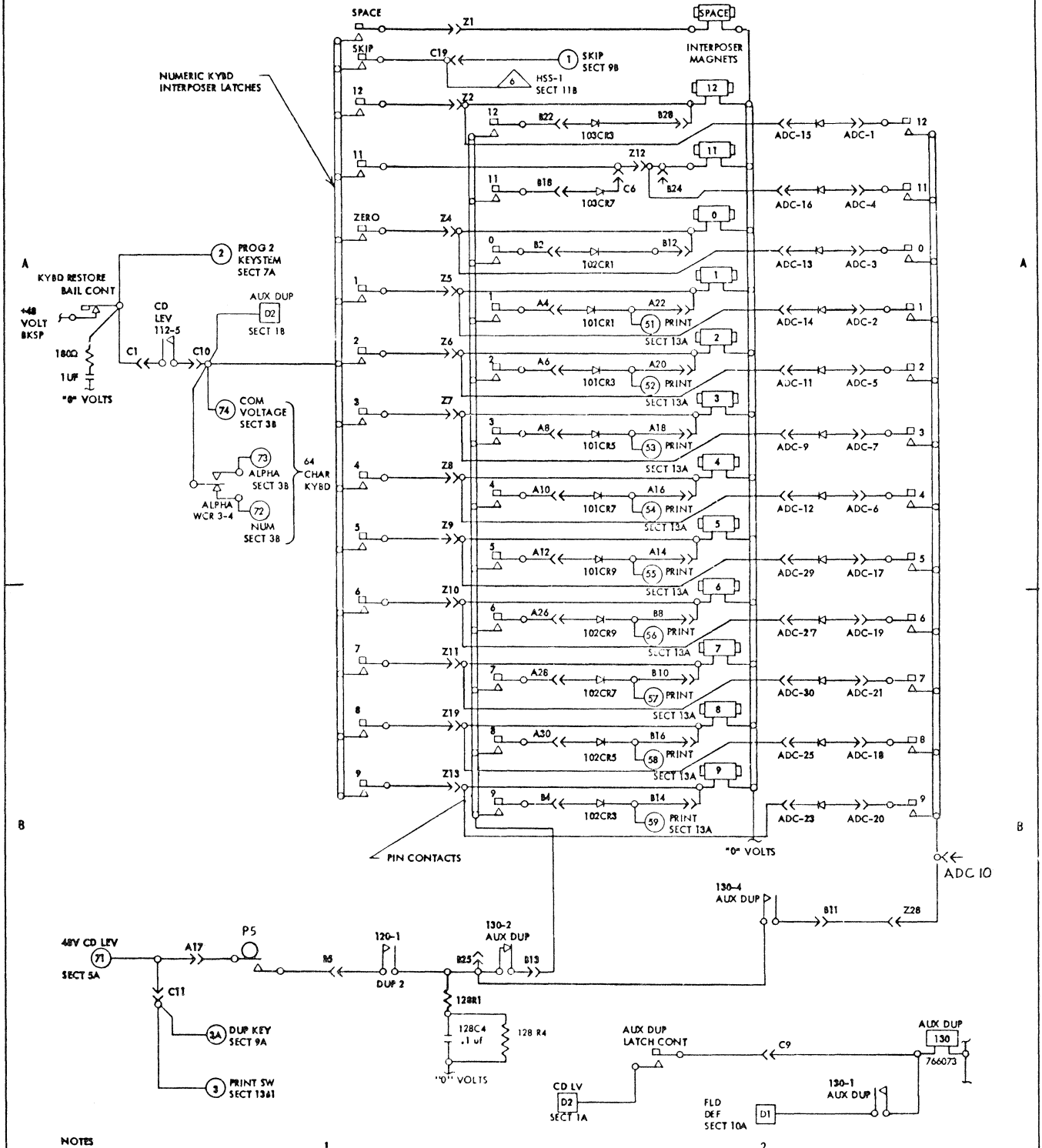
ADDED CABLE WIRING

INTERNATIONAL BUSINESS MACHINES CORP.					DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM				28APR67	205975A			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	WRC	31MAR67	MODEL							
DETAIL										
CHECK	RAS	31MAR67	DRAW	IDI	6APR67					
APPRO	RJE	31MAR67	CHECK							

5373564

00.29.02.1

REED RELAY
NUMERIC KEYBOARD AND INTERPOSERS/AUX DUP
MODEL A



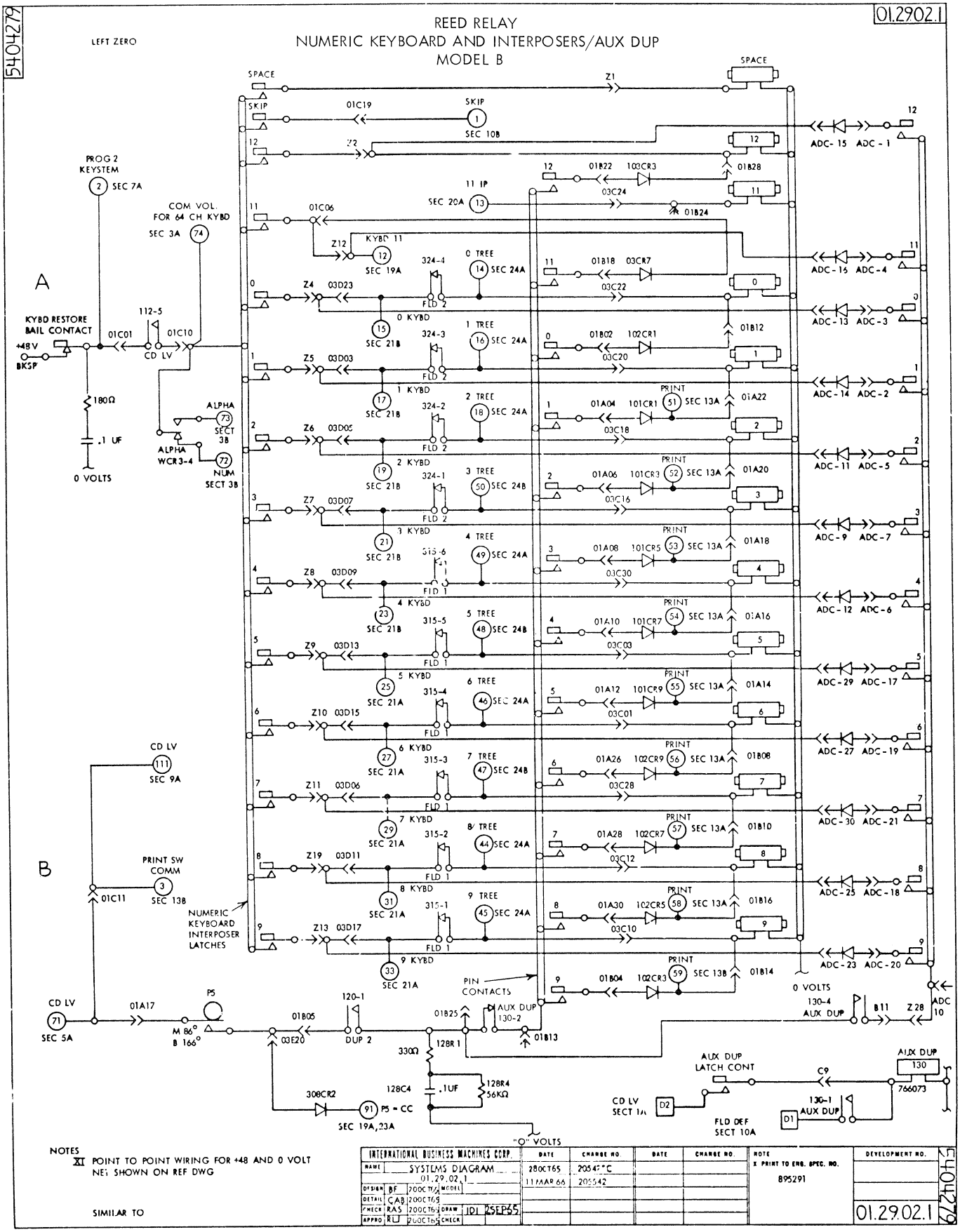
NOTES

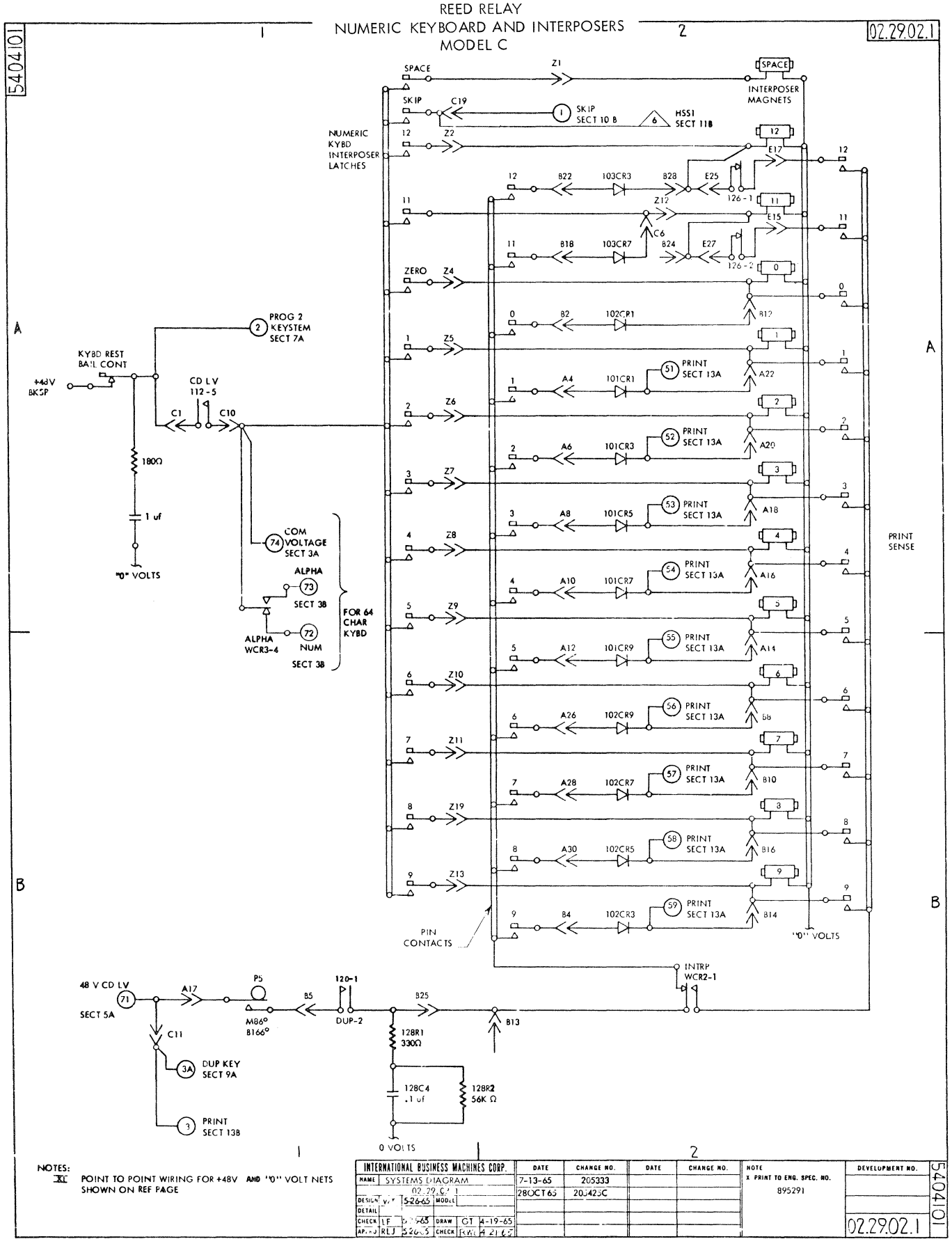
XI

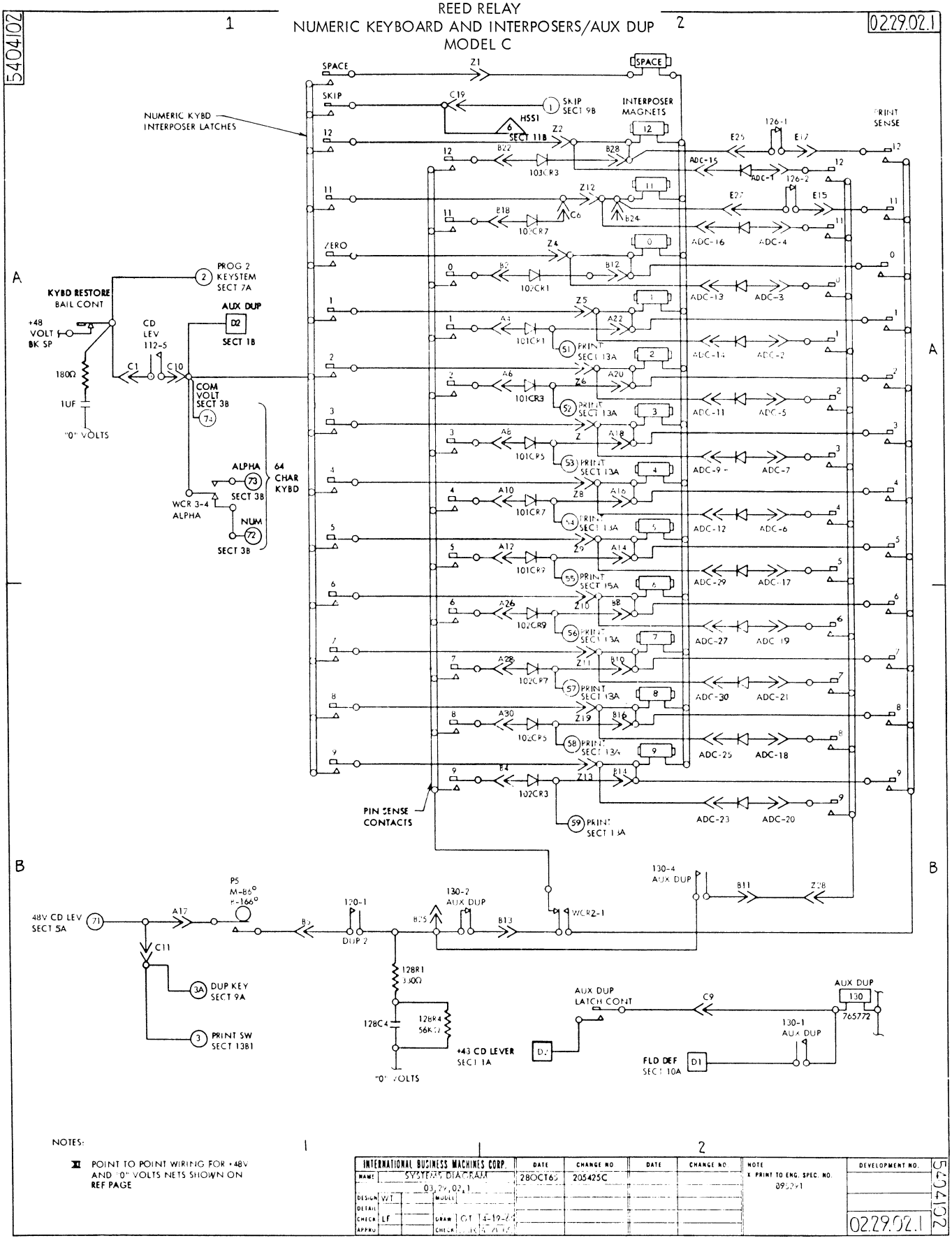
XII POINT TO POINT WIRING FOR +48V AND "0" VOLTS NETS SHOWN ON REF PAGE

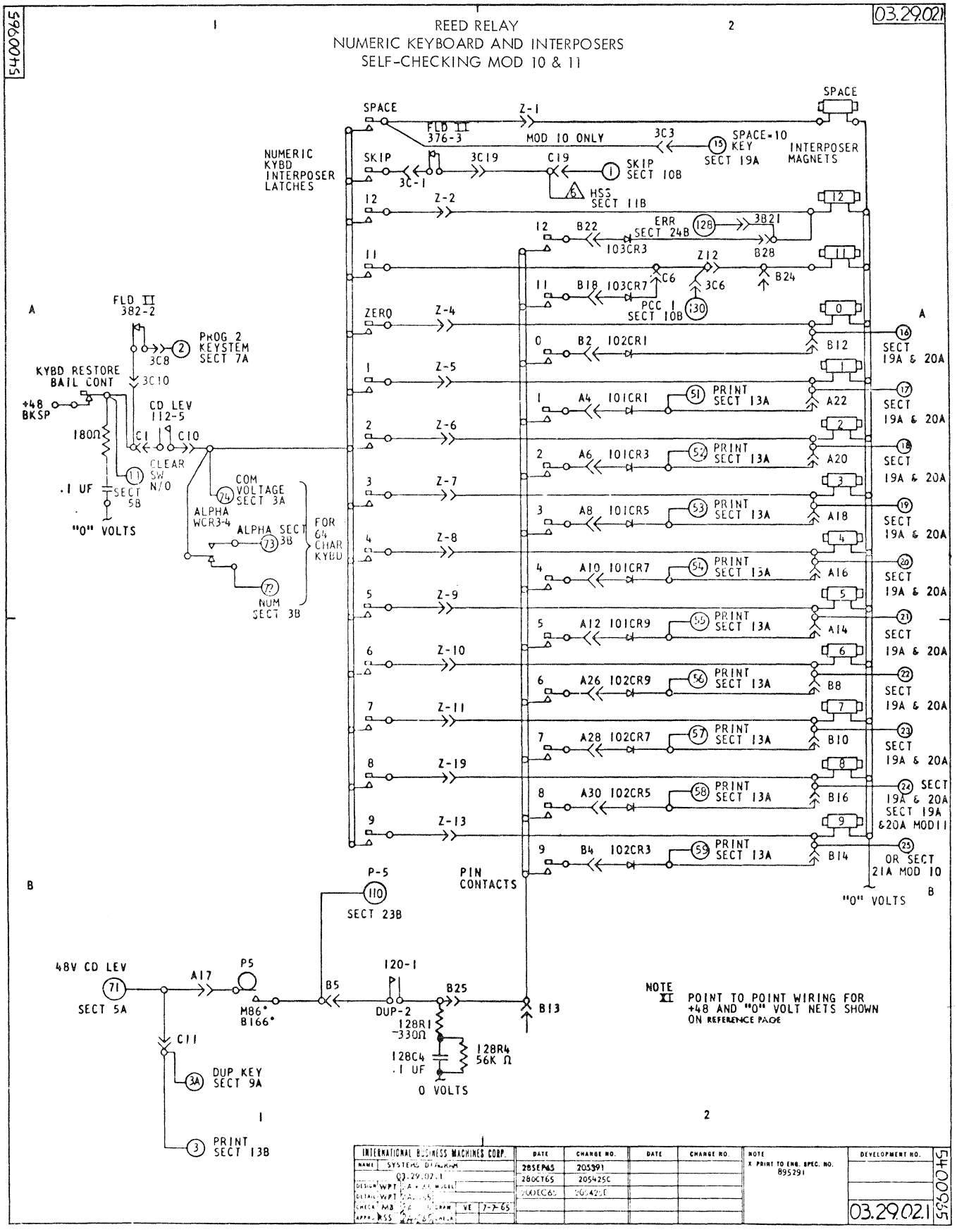
INTERNATIONAL BUSINESS MACHINES CORP.	DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME SYSTEMS DIAGRAM 00.29.02.1	3-15-65	205255			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN WI 2-1-65	3-3-65	205262A				
DETAIL	7SEP65	205328				
CHECK LF 2-1-65 DRAW LH 3-5-65	26OCT65	206426C				00.2902.1
APPRVD J.C 2-1-65 DSGN						

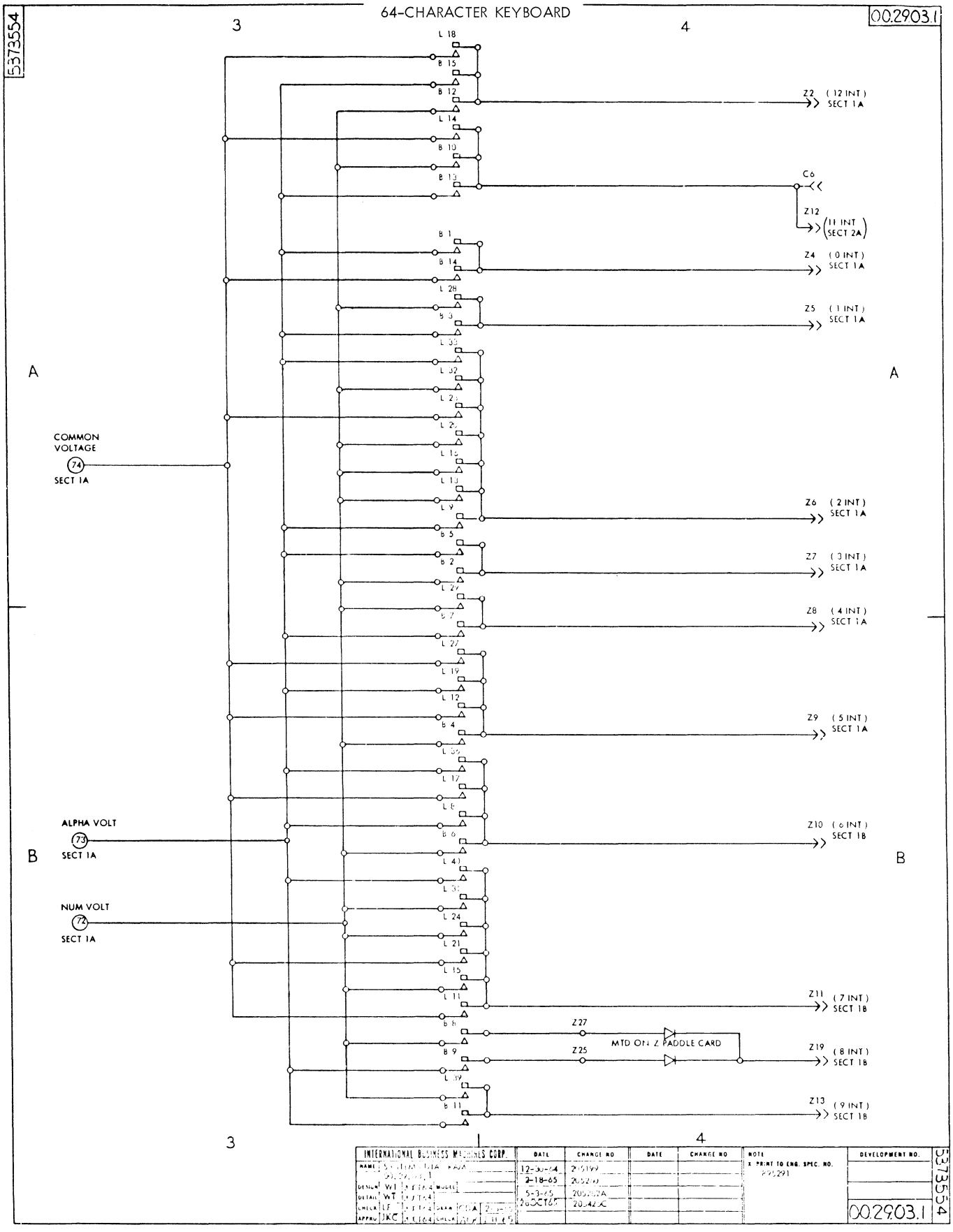
5373564

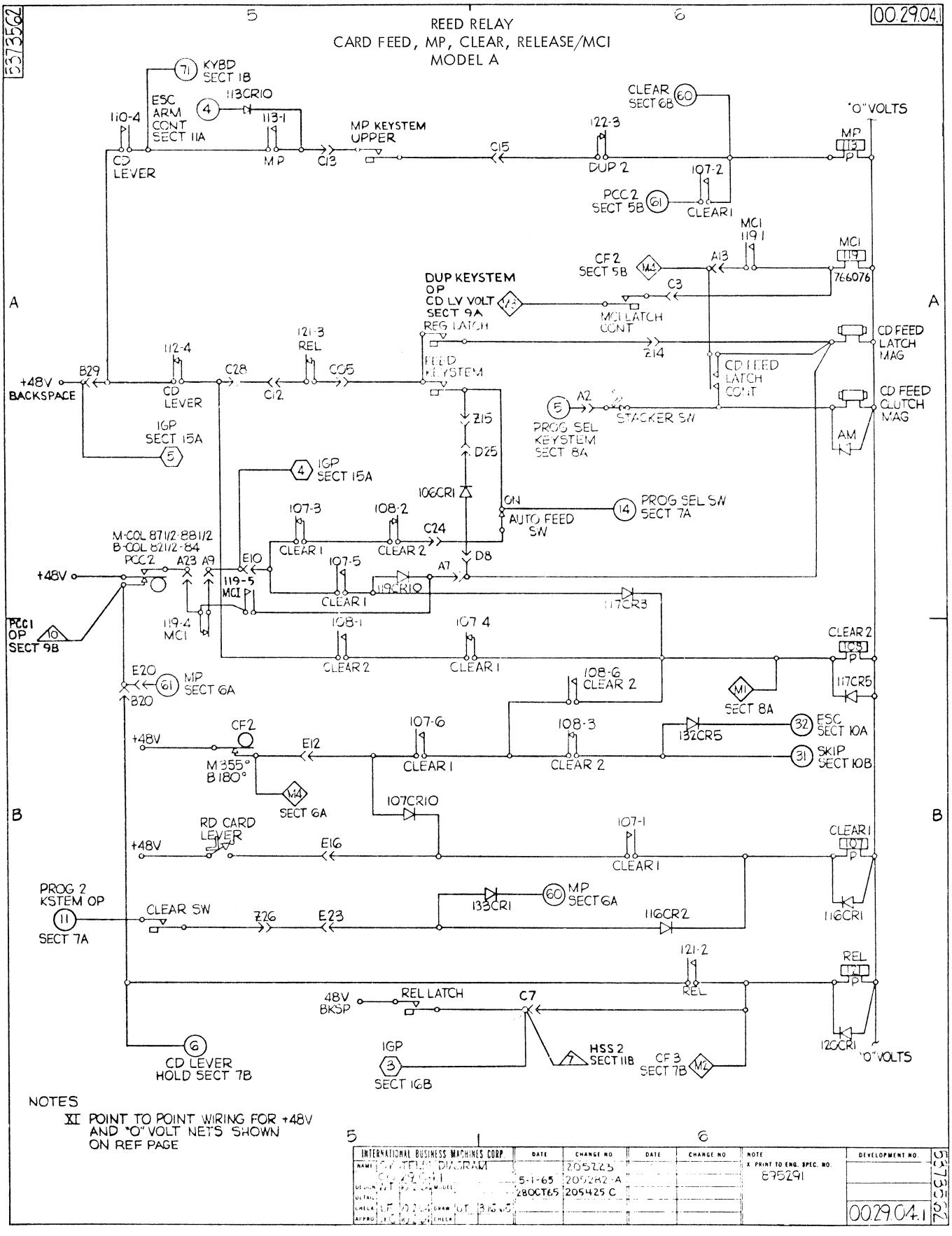

5404279
01.2902.1
LEFT ZERO
REED RELAY
NUMERIC KEYBOARD AND INTERPOSERS/AUX DUP
MODEL B
SPACE
SKIP
PROG 2 KEYSTEM
COM VOL. FOR 64 CH KYBD
KYBD RESTORE BAIL CONTACT
+48V BKSP
180Ω
.1 UF
0 VOLTS
ALPHA SECT 3B
ALPHA WCR3-4
NUM SECT 3B
CD LV
PRINT SW COMM
NUMERIC KEYBOARD INTERPOSER LATCHES
PIN CONTACTS
AUX DUP 130-2
0 VOLTS
130-4 AUX DUP
ADC 10
P5
M 86° B 166°
DUP 2
330Ω
128R1
128C4
.1UF
128R4 56KΩ
308CR2
P5 = CC
AUX DUP LATCH CONT
FLD DEF SECT 10A
130-1 AUX DUP
766073
"0" VOLTS
A
B
NOTES
XI POINT TO POINT WIRING FOR +48 AND 0 VOLT NETS SHOWN ON REF DWG
SIMILAR TO
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
01.29.02.1
DESIGN BF 20OCT65 MODEL
DETAIL CAB 20OCT65
CHECK RAS 20OCT65 DRAW JDI 25SEP65
APPRO RU 20OCT65 CHECK
DATE 28OCT65 CHANGE NO. 205472
11MAR66 205542
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
01.29.02.1
5404279

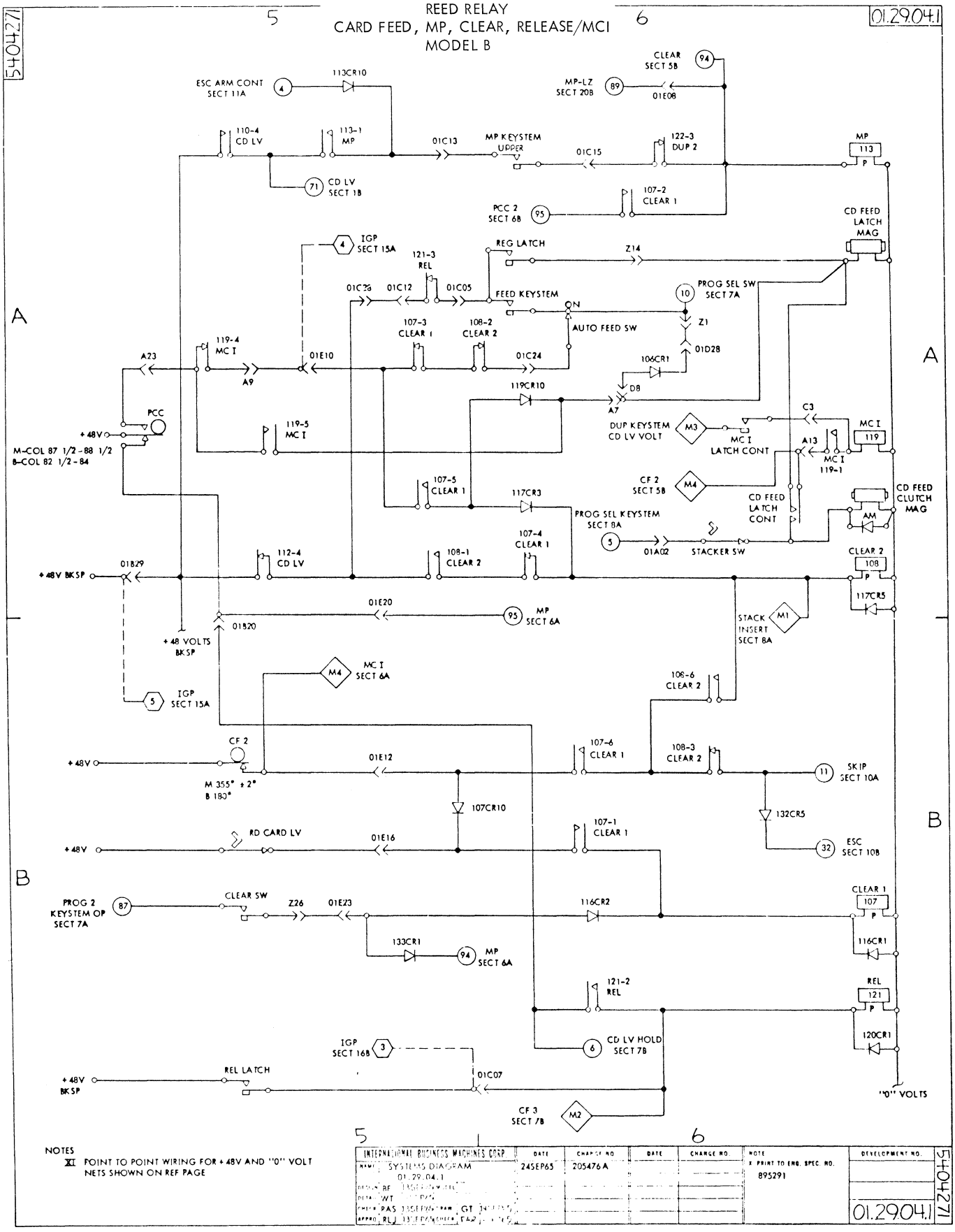

REED RELAY
NUMERIC KEYBOARD AND INTERPOSERS
MODEL C
02.29.02.1
5404101
SPACE
Z1
INTERPOSER MAGNETS
SKIP
C19
SKIP SECT 10 B
HSS1 SECT 11B
NUMERIC KYBD INTERPOSER LATCHES
Z2
E17
B22
103CR3
B28
E25
126-1
Z12
C6
E15
B18
103CR7
B24
E27
126-2
ZERO
Z4
B12
B2
102CP1
Z5
A22
A4
101CR1
PRINT SECT 13A
Z6
A20
A6
101CR3
Z7
A18
A8
101CR5
Z8
A16
A10
101CR7
Z9
A14
A12
101CR9
Z10
B6
A26
102CR9
Z11
B10
A28
102CR7
Z19
B16
A30
102CR5
Z13
B14
B4
102CR3
PIN CONTACTS
"0" VOLTS
PRINT SENSE
PROG 2 KEYSTEM SECT 7A
KYBD REST BAIL CONT
+48V BKSP
CD LV 112-5
C1
C10
180Ω
1 uf
"0" VOLTS
COM VOLTAGE SECT 3A
ALPHA SECT 3B
ALPHA WCR3-4
NUM SECT 3B
FOR 64 CHAR KYBD
INTRP WCR2-1
48 V CD LV
SECT 5A
A17
P5
M86°
B166°
B5
120-1
DUP-2
B25
B13
128R1
330Ω
128C4
.1 uf
128R2
56K Ω
0 VOLTS
C11
DUP KEY SECT 9A
PRINT SECT 13B
NOTES:
POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
02.29.02.1
DESIGN
DETAIL
CHECK LF
APPD RLJ
DRAW GT 4-19-65
CHECK
DATE
CHANGE NO.
7-13-65
280CT65
205333
20J425C
NOTE
X PRINT TO ENG. SPEC. NO.
895291
DEVELOPMENT NO.
02.29.02.1
5404101

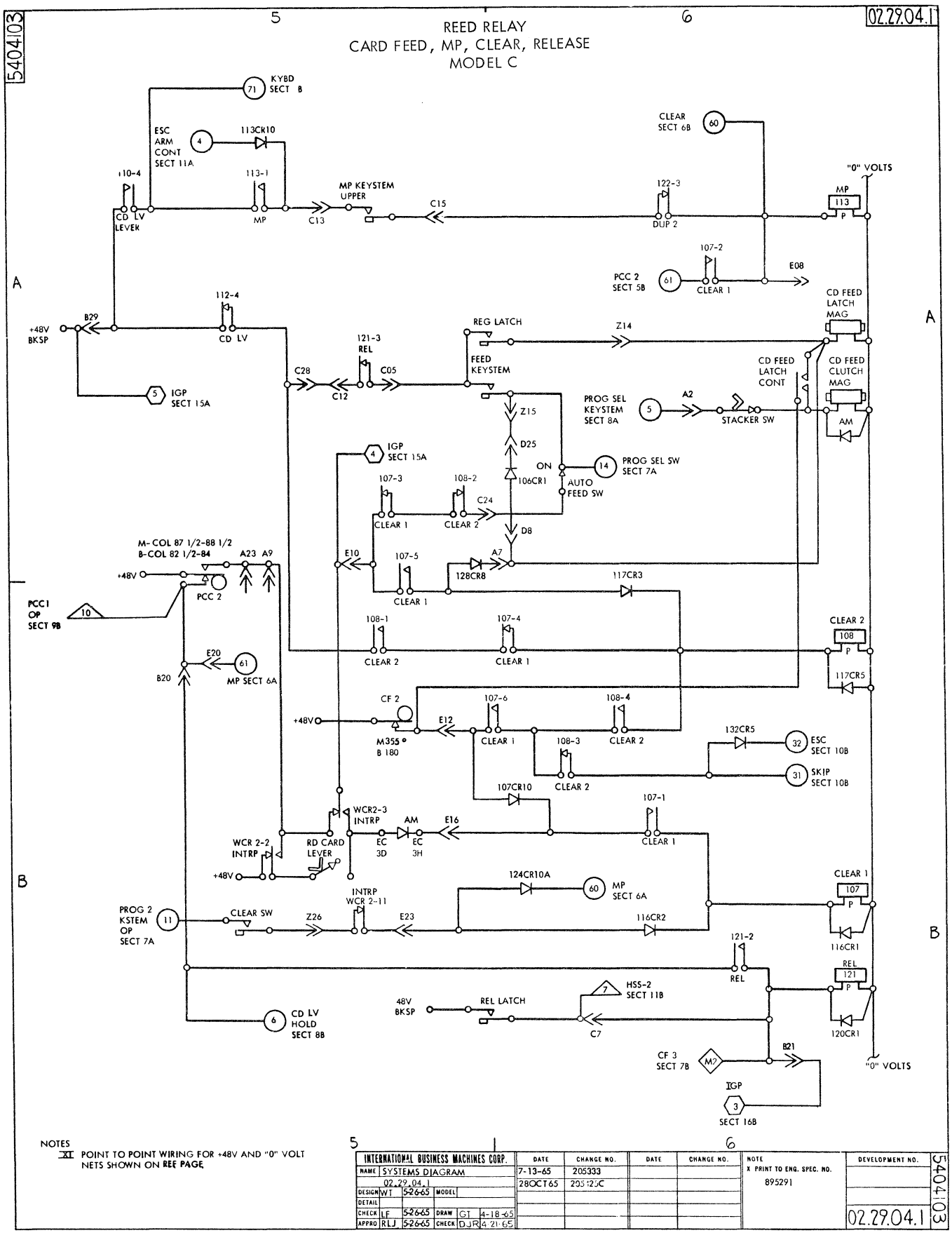

5404102
REED RELAY
NUMERIC KEYBOARD AND INTERPOSERS/AUX DUP
MODEL C
02.29.02.1
SPACE
SKIP
NUMERIC KYBD INTERPOSER LATCHES
INTERPOSER MAGNETS
PRINT SENSE
ZERO
KYBD RESTORE BAIL CONT
PROG 2 KEYSTEM SECT 7A
AUX DUP
+48 VOLT BK SP
CD LEV 112-5
180Ω
1UF
"0" VOLTS
COM VOLT SECT 3B
ALPHA
NUM
64 CHAR KYBD
WCR 3-4 ALPHA
PIN SENSE CONTACTS
48V CD LEV SECT 5A
DUP KEY SECT 9A
PRINT SW SECT 13B1
128R1 1.90Ω
128C4
128R4 56KΩ
+43 CD LEVER SECT 1A
AUX DUP LATCH CONT
FLD DEF SECT 10A
765772
NOTES:
POINT TO POINT WIRING FOR +48V AND "0" VOLTS NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
28OCT65
205425C
X PRINT TO ENG. SPEC. NO. 09.29.1
DEVELOPMENT NO.
5404102
02.29.02.1


5400965
03.29.02.1
REED RELAY
NUMERIC KEYBOARD AND INTERPOSERS
SELF-CHECKING MOD 10 & 11
SPACE
Z-1
FLD II 376-3
MOD 10 ONLY
3C3
SPACE-10 KEY SECT 19A
INTERPOSER MAGNETS
NUMERIC KYBD INTERPOSER LATCHES
SKIP
3C19
C19
SKIP SECT 10B
3C-1
HSS SECT 11B
Z-2
ERR SECT 24B
3B21
B22
103CR3
Z12
B28
C6
3C6
B24
B1B
103CR7
PCC 1 SECT 10B
ZERO
Z-4
B2
102CR1
B12
Z-5
A4
101CR1
PRINT SECT 13A
A22
Z-6
A6
101CR3
A20
Z-7
A8
101CR5
A18
Z-8
A10
101CR7
A16
Z-9
A12
101CR9
A14
Z-10
A26
102CR9
B8
Z-11
A28
102CR7
B10
Z-19
A30
102CR5
B16
Z-13
B4
102CR3
B14
SECT 19A & 20A
SECT 19A & 20A MOD 11
OR SECT 21A MOD 10
"0" VOLTS
FLD II 382-2
PROG 2 KEYSTEM SECT 7A
3C8
KYBD RESTORE BAIL CONT
3C10
+48 BKSP
CD LEV 112-5
180Ω
C1
C10
CLEAR SW N/O
.1 UF
SECT 5B
"0" VOLTS
COM VOLTAGE SECT 3A
ALPHA WCR3-4
ALPHA SECT 3B
NUM SECT 3B
FOR 64 CHAR KYBD
P-5
SECT 23B
PIN CONTACTS
48V CD LEV
SECT 5A
A17
P5
M86°
B166°
B5
120-1
DUP-2
B25
B13
128R1 330Ω
128C4 .1 UF
128R4 56K Ω
0 VOLTS
C11
DUP KEY SECT 9A
PRINT SECT 13B
NOTE XI
POINT TO POINT WIRING FOR +48 AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.02.1
DESIGN WPT
DETAIL WPT
CHECK MB
APPR. RSS
VE 7-7-65
DATE
CHANGE NO.
28SEP65 205391
28OCT65 205425C
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.02.1
5400965


REED RELAY
64-CHARACTER KEYBOARD
5373554
00.2903.1
3
4
A
B
L 18
B 15
B 12
L 14
B 10
B 13
B 1
B 14
L 28
B 3
L 30
L 32
L 26
L 24
L 16
L 13
L 9
B 5
B 2
L 27
B 7
L 29
L 19
L 12
B 4
L 31
L 17
L 8
B 6
L 4
L 31
L 24
L 21
L 15
L 11
B 8
B 9
L 19
B 11
Z2 (12 INT) SECT 1A
C6
Z12 (11 INT SECT 2A)
Z4 (0 INT) SECT 1A
Z5 (1 INT) SECT 1A
Z6 (2 INT) SECT 1A
Z7 (3 INT) SECT 1A
Z8 (4 INT) SECT 1A
Z9 (5 INT) SECT 1A
Z10 (6 INT) SECT 1B
Z11 (7 INT) SECT 1B
Z27
Z25
MTD ON Z PADDLE CARD
Z19 (8 INT) SECT 1B
Z13 (9 INT) SECT 1B
COMMON VOLTAGE
74
SECT 1A
ALPHA VOLT
73
SECT 1A
NUM VOLT
72
SECT 1A
INTERNATIONAL BUSINESS MACHINES CORP.
DATE
CHANGE NO
NOTE
X PRINT TO ENG. SPEC. NO.
DEVELOPMENT NO.
12-30-64
2-18-65
5-3-65
26OCT65
00.2903.1
5373554


5373562
00.29.04
REED RELAY
CARD FEED, MP, CLEAR, RELEASE/MCI
MODEL A
KYBD SECT 1B
ESC ARM CONT SECT 11A
113CR10
110-4
113-1
CD LEVER
MP
C13
MP KEYSTEM UPPER
C15
122-3
DUP 2
CLEAR SECT 6B
60
"O" VOLTS
MP
107-2
PCC 2 SECT 5B
61
CLEAR1
MCI 119-1
MCI
CF 2 SECT 5B
A13
C3
766076
DUP KEYSTEM OP CD LV VOLT SECT 9A
REG LATCH
MCI LATCH CONT
Z14
CD FEED LATCH MAG
CD FEED LATCH CONT
112-4
121-3 REL
B29
+48V BACKSPACE
C28
C05
C12
FEED KEYSTEM
CD LEVER
A2
STACKER SW
CD FEED CLUTCH MAG
AM
PROG SEL KEYSTEM SECT 8A
IGP SECT 15A
Z15
D25
106CR1
ON
AUTO FEED SW
PROG SEL SW SECT 7A
14
107-3
108-2
C24
CLEAR 1
CLEAR 2
M-COL 87 1/2-88 1/2
B-COL 82 1/2-84
PCC 2
A23
A9
E10
+48V
119-5 MCI
119CR10
107-5
D8
A7
117CR3
119-4 MCI
108-1
107 4
PCC1 OP SECT 9B
10
CLEAR 2
C05
E20
MP SECT 6A
B20
108-6 CLEAR 2
M1
SECT 8A
117CR5
CF2
107-6
108-3
132CR5
32
ESC SECT 10A
+48V
E12
M 355°
B 180°
M4
SECT 6A
31
SKIP SECT 10B
107CR10
RD CARD LEVER
107-1
CLEAR1
C07
+48V
E16
PROG 2 KSTEM OP
11
SECT 7A
CLEAR SW
Z26
E23
133CR1
60
MP SECT 6A
116CR2
116CR1
121-2
REL
48V BKSP
REL LATCH
C7
IGP
3
SECT 16B
HSS 2 SECT 11B
7
CF 3 SECT 7B
M2
120CR1
"O" VOLTS
6
CD LEVER HOLD SECT 7B
NOTES
XI POINT TO POINT WIRING FOR +48V AND "O" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP
DATE
CHANGE NO.
NOTE
X PRINT TO ENG. SPEC. NO.
875291
DEVELOPMENT NO.
5373562
00.29.04.1
5-1-65
28OCT65
205223
205282-A
205425 C


5404271
REED RELAY
CARD FEED, MP, CLEAR, RELEASE/MCI
MODEL B
01.29.041
ESC ARM CONT SECT 11A
113CR10
CLEAR SECT 5B
MP-LZ SECT 20B
01E08
110-4 CD LV
113-1 MP
01C13
MP KEYSTEM UPPER
01C15
122-3 DUP 2
MP 113 P
CD LV SECT 1B
PCC 2 SECT 6B
107-2 CLEAR 1
CD FEED LATCH MAG
IGP SECT 15A
REG LATCH
Z14
121-3 REL
01C26
01C12
01C05
FEED KEYSTEM
PROG SEL SW SECT 7A
AUTO FEED SW
Z1
01D28
107-3 CLEAR 1
108-2 CLEAR 2
119-4 MC I
A23
A9
01E10
01C24
106CR1
D8
A7
119CR10
PCC
+48V
M-COL 87 1/2-88 1/2
8-COL 82 1/2-84
119-5 MC I
DUP KEYSTEM CD LV VOLT
M3
C3
MC I LATCH CONT
A13
MC I 119
MC I 119-1
CF 2 SECT 5B
M4
107-5 CLEAR 1
117CR3
CD FEED LATCH CONT
CD FEED CLUTCH MAG
AM
PROG SEL KEYSTEM SECT 8A
01A02
STACKER SW
107-4 CLEAR 1
112-4 CD LV
108-1 CLEAR 2
+48V BKSP
01B29
CLEAR 2 108 P
117CR5
01E20
MP SECT 6A
01B20
+48 VOLTS BKSP
STACK INSERT SECT 8A
M1
MC I SECT 6A
106-6 CLEAR 2
IGP SECT 15A
CF 2
+48V
M 355° ± 2°
B 180°
01E12
107-6 CLEAR 1
108-3 CLEAR 2
SKIP SECT 10A
107CR10
132CR5
RD CARD LV
01E16
107-1 CLEAR 1
ESC SECT 10B
PROG 2 KEYSTEM OP SECT 7A
CLEAR SW
Z26
01E23
116CR2
CLEAR 1 107 P
133CR1
MP SECT 6A
116CR1
121-2 REL
REL 121 P
120CR1
IGP SECT 16B
CD LV HOLD SECT 7B
REL LATCH
01C07
"0" VOLTS
CF 3 SECT 7B
M2
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP
SYSTEMS DIAGRAM
01.29.04.1
DATE 24SEP65
CHANGE NO. 205476A
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5404271
01.29.041



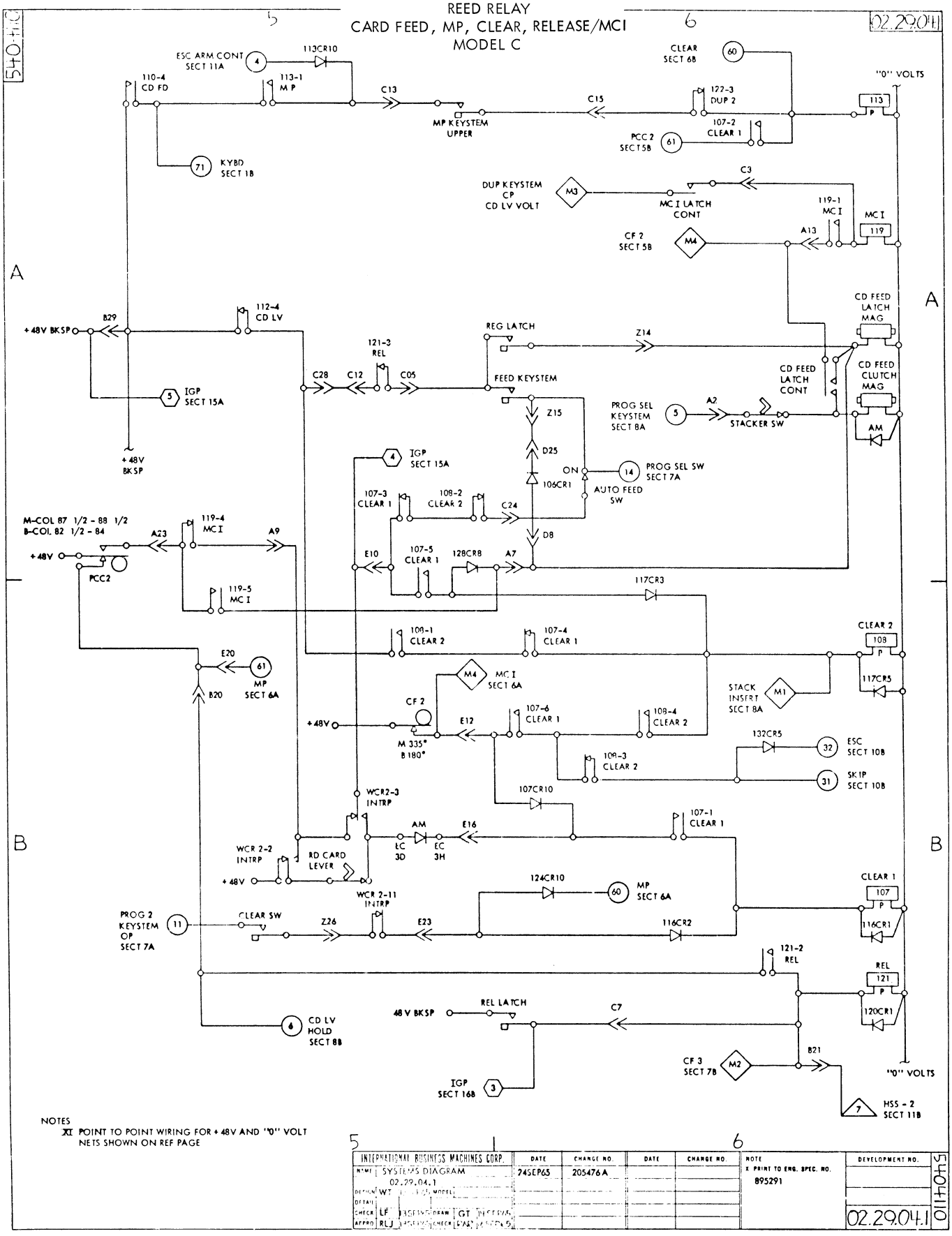
NOTES

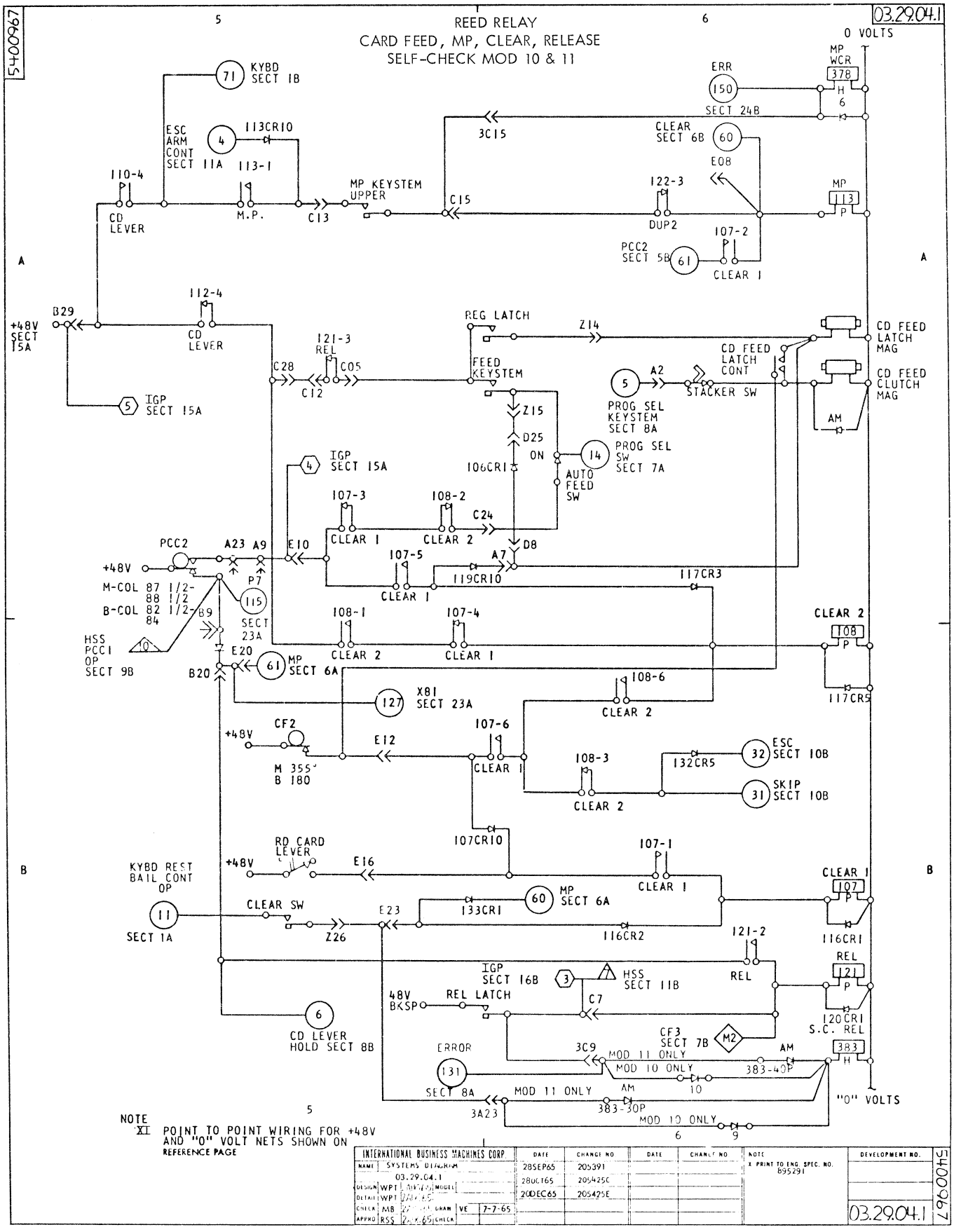
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REE PAGE

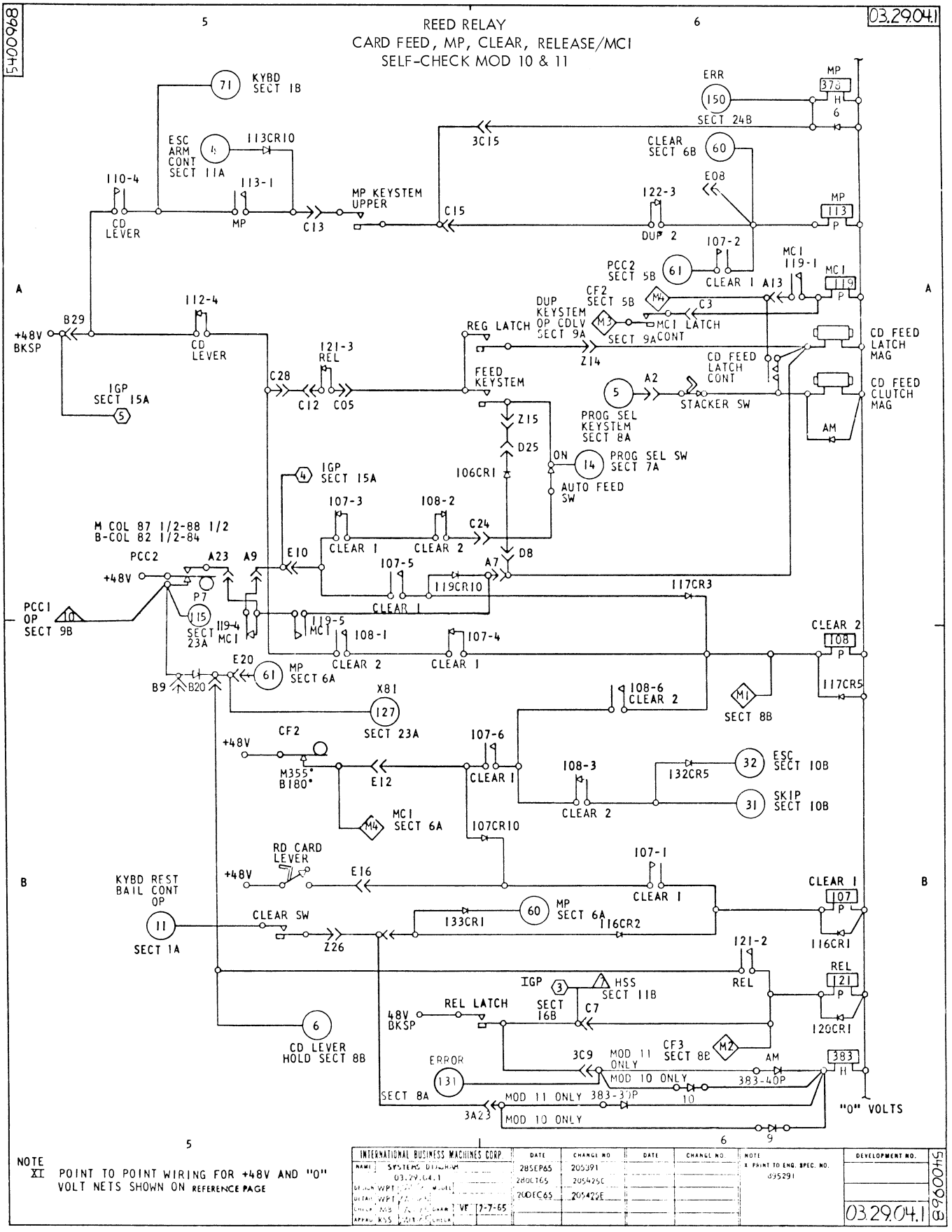
INTERNATIONAL BUSINESS MACHINES CORP.													
NAME	SYSTEMS DIAGRAM												
	02.29.04.1												
DESIGN	WT	52665	MODEL										
DETAIL													
CHECK	LF	52665	DRAW	GT	4-18-65								
APPRO	RLJ	52665	CHECK	DJR	4 21-65								

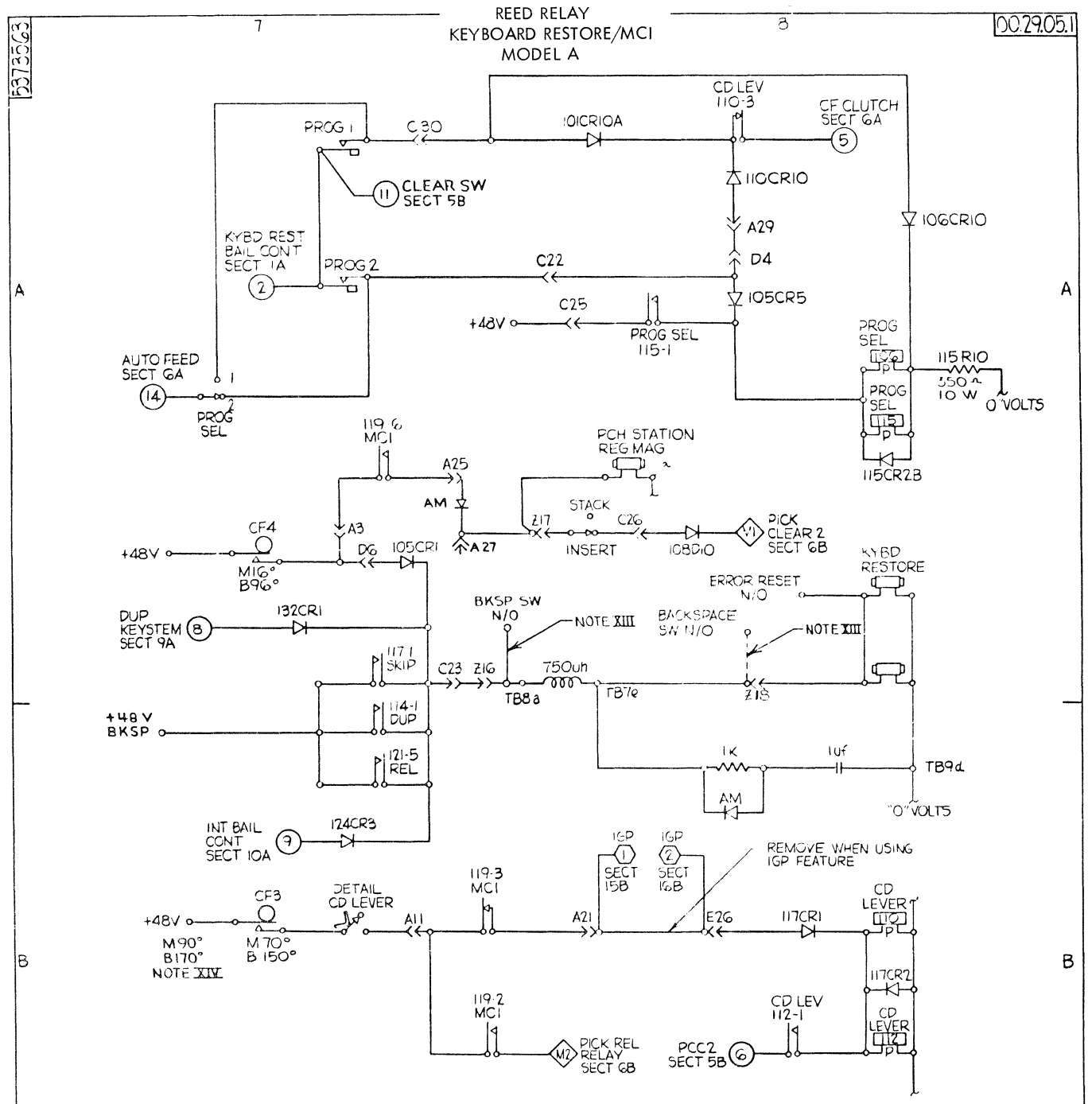
DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
7-13-65	205333			X PRINT TO ENG. SPEC. NO. 895291	
28OCT65	205125C				
					02.29.04.1

5404103


REED RELAY
CARD FEED, MP, CLEAR, RELEASE/MCI
MODEL C
02.29.04
540-41C
ESC ARM CONT SECT 11A
113CR10
110-4 CD FD
113-1 M P
C13
MP KEYSTEM UPPER
C15
122-3 DUP 2
CLEAR SECT 6B
"0" VOLTS
107-2 CLEAR 1
PCC 2 SECT 5B
KYBD SECT 1B
DUP KEYSTEM CP CD LV VOLT
C3
MC I LATCH CONT
119-1 MC I
MC I
CF 2 SECT 5B
A13
112-4 CD LV
+48V BKSP
B29
REG LATCH
Z14
121-3 REL
C28
C12
C05
FEED KEYSTEM
CD FEED LATCH MAG
CD FEED CLUTCH MAG
CD FEED LATCH CONT
IGP SECT 15A
PROG SEL KEYSTEM SECT 8A
A2
STACKER SW
Z15
D25
106CR1
ON
PROG SEL SW SECT 7A
AUTO FEED SW
107-3 CLEAR 1
108-2 CLEAR 2
C24
D8
M-COL 87 1/2 - 88 1/2
B-COL 82 1/2 - 84
A23
119-4 MC I
A9
E10
107-5 CLEAR 1
128CR8
A7
PCC2
119-5 MC I
117CR3
109-1 CLEAR 2
107-4 CLEAR 1
CLEAR 2
108
117CR5
E20
B20
MP SECT 6A
MC I SECT 6A
STACK INSERT SECT 8A
CF 2
M 335°
B 180°
E12
107-6 CLEAR 1
108-4 CLEAR 2
132CR5
ESC SECT 10B
109-3 CLEAR 2
SKIP SECT 10B
107CR10
WCR2-3 INTRP
107-1 CLEAR 1
AM
E16
LC 3D
EC 3H
WCR 2-2 INTRP
RD CARD LEVER
124CR10
MP SECT 6A
CLEAR 1
107
116CR1
WCR 2-11 INTRP
PROG 2 KEYSTEM OP SECT 7A
CLEAR SW
Z26
E23
116CR2
121-2 REL
REL
121
120CR1
CD LV HOLD SECT 8B
48 V BKSP
REL LATCH
C7
CF 3 SECT 7B
B21
IGP SECT 16B
HSS - 2 SECT 11B
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
02.29.04.1
24SEP65
205476A
895291
02.29.04.1
SHEET 110


5400967
03.29.04.1
REED RELAY
CARD FEED, MP, CLEAR, RELEASE
SELF-CHECK MOD 10 & 11
0 VOLTS
KYBD SECT 1B
ESC ARM CONT SECT 11A
113CR10
113-1
110-4
CD LEVER
M.P.
MP KEYSTEM UPPER
C13
C15
3C15
ERR
SECT 24B
CLEAR SECT 6B
E08
122-3
DUP2
MP WCR 378 H 6
MP 113 P
PCC2 SECT 5B
107-2
CLEAR 1
112-4
B29
+48V SECT 15A
IGP SECT 15A
REG LATCH
Z14
CD FEED LATCH MAG
CD FEED LATCH CONT
CD FEED CLUTCH MAG
AM
121-3 REL
C28
C05
C12
FEED KEYSTEM
A2
STACKER SW
PROG SEL KEYSTEM SECT 8A
Z15
D25
ON
106CR1
PROG SEL SW SECT 7A
AUTO FEED SW
107-3
108-2
C24
CLEAR 1
CLEAR 2
D8
PCC2
A23 A9
E10
+48V
M-COL 87 1/2-88 1/2
B-COL 82 1/2-84
B9
P7
115 SECT 23A
107-5
A7
119CR10
117CR3
HSS PCC1 OP SECT 9B
E20
B20
61 MP SECT 6A
108-1
107-4
CLEAR 2
CLEAR 1
108-6
117CR5
X81 SECT 23A
127
CF2
+48V
M 355
B 180
E12
107-6
CLEAR 1
108-3
132CR5
32 ESC SECT 10B
31 SKIP SECT 10B
107CR10
RD CARD LEVER
KYBD REST BAIL CONT OP
11 SECT 1A
+48V
E16
107-1
CLEAR 1
CLEAR SW
E23
Z26
133CR1
60 MP SECT 6A
116CR2
116CR1
121-2
REL
IGP SECT 16B
3 HSS SECT 11B
48V BKSP
REL LATCH
C7
6 CD LEVER HOLD SECT 8B
CF3 SECT 7B
M2
120CR1 S.C. REL
ERROR
131 SECT 8A
3C9
MOD 11 ONLY
MOD 10 ONLY
AM
383-40P
383 H
"0" VOLTS
3A23
383-30P
NOTE
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.04.1
DESIGN WPT
DETAIL WPT
CHECK MB
APPRO RSS
7-7-65
DATE 28SEP65 CHANGE NO. 205391
28OCT65 205425C
20DEC65 205425E
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.04.1
5400967


03.29.04.1
REED RELAY
CARD FEED, MP, CLEAR, RELEASE/MCI
SELF-CHECK MOD 10 & 11
KYBD SECT 1B
ESC ARM CONT SECT 11A
113CR10
110-4
113-1
CD LEVER
MP
MP KEYSTEM UPPER
C13
C15
3C15
ERR
MP
SECT 24B
CLEAR SECT 6B
E08
122-3
DUP 2
107-2
PCC2 SECT 5B
CLEAR 1
MC1 119-1
CF2 SECT 5B
DUP KEYSTEM OP CDLV SECT 9A
MC1 LATCH SECT 9A CONT
C3
A13
112-4
B29
+48V BKSP
REG LATCH
Z14
CD FEED LATCH MAG
CD FEED LATCH CONT
CD FEED CLUTCH MAG
121-3 REL
C28
C12
C05
FEED KEYSTEM
IGP SECT 15A
A2
STACKER SW
PROG SEL KEYSTEM SECT 8A
Z15
D25
AM
ON
PROG SEL SW SECT 7A
106CR1
AUTO FEED SW
107-3
108-2
C24
CLEAR 1
CLEAR 2
M COL 87 1/2-88 1/2
B-COL 82 1/2-84
PCC2
A23
A9
E10
+48V
P7
107-5
A7
D8
119CR10
117CR3
PCC1 OP SECT 9B
SECT 23A
119-4 MC1
119-5 MC1
108-1
107-4
CLEAR 2
108
117CR5
E20
MP SECT 6A
B9
B20
X81
SECT 23A
108-6 CLEAR 2
SECT 8B
CF2
107-6
M355°
B180°
E12
CLEAR 1
108-3
132CR5
ESC SECT 10B
SKIP SECT 10B
MC1 SECT 6A
107CR10
RD CARD LEVER
107-1
KYBD REST BAIL CONT OP
E16
CLEAR SW
133CR1
MP SECT 6A
116CR2
116CR1
SECT 1A
Z26
121-2
REL
IGP
HSS SECT 11B
REL LATCH
SECT 16B
C7
48V BKSP
120CR1
CD LEVER HOLD SECT 8B
CF3 SECT 8B
3C9
MOD 11 ONLY
MOD 10 ONLY
383-40P
ERROR
SECT 8A
MOD 11 ONLY 383-33P
3A23
MOD 10 ONLY
"0" VOLTS
NOTE
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIVISION
03.29.04.1
7-7-65
28SEP65
280CT65
20DEC65
205391
205425C
205425E
X PRINT TO ENG. SPEC. NO. 695291
DEVELOPMENT NO.
03.29.04.1



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

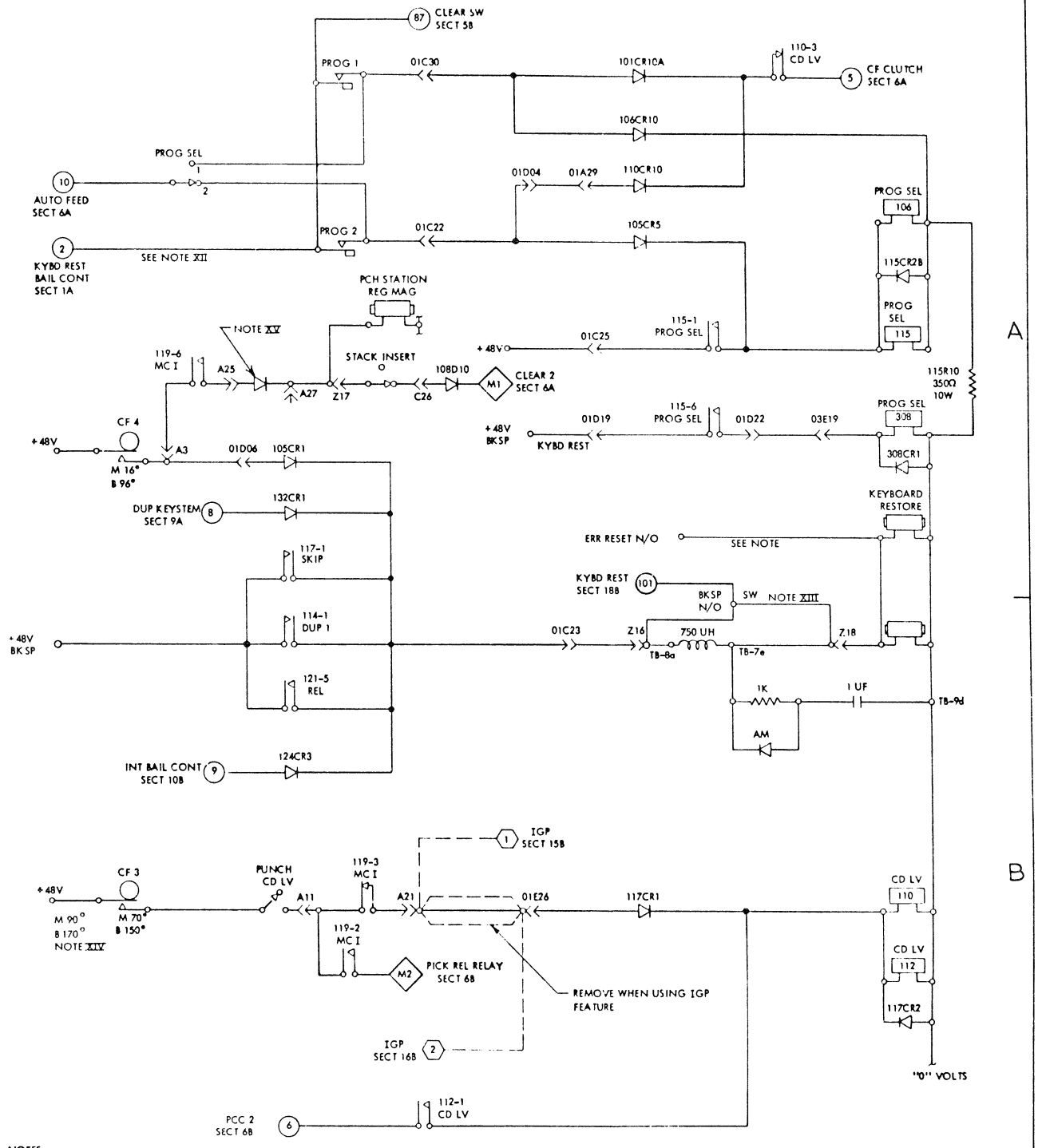
XII POINT TO POINT WIRING FOR THIS NET SHOWN ON REF PAGE

XIII FACTORY CHANGE APPROX APRIL 1966

XIV CAM TIMINGS FOR HSS AND VLCD ONLY

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM 00.29.05.1			5-16-65	205223			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	NT 12-24	MODEL		28OCT65	205425 C				
DETAIL									
CHECK	LF 10-27-4	DRAW	GT 3-16-65	25 MAY 66	205639				00.29.05.1
APPRO	JKC 12-27-4	CHECK							

REED RELAY
KEYBOARD RESTORE, PROG SEL, CD LEV/MCI
MODEL B



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

XII POINT TO POINT NET SHOWN ON REF PAGE

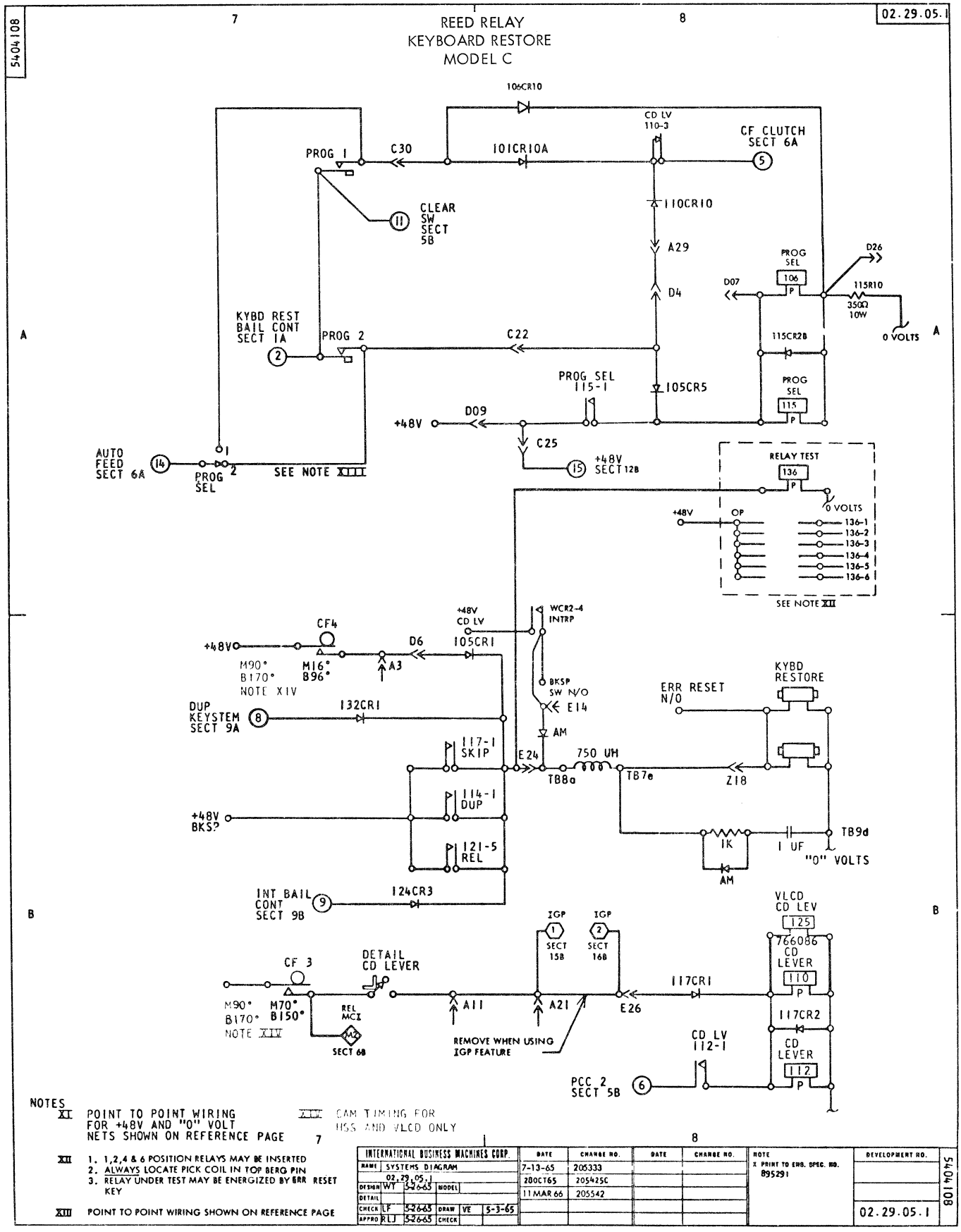
XIII EARLY MODEL MACHINES HAVE BKSP SW N O WIRED TO Z18

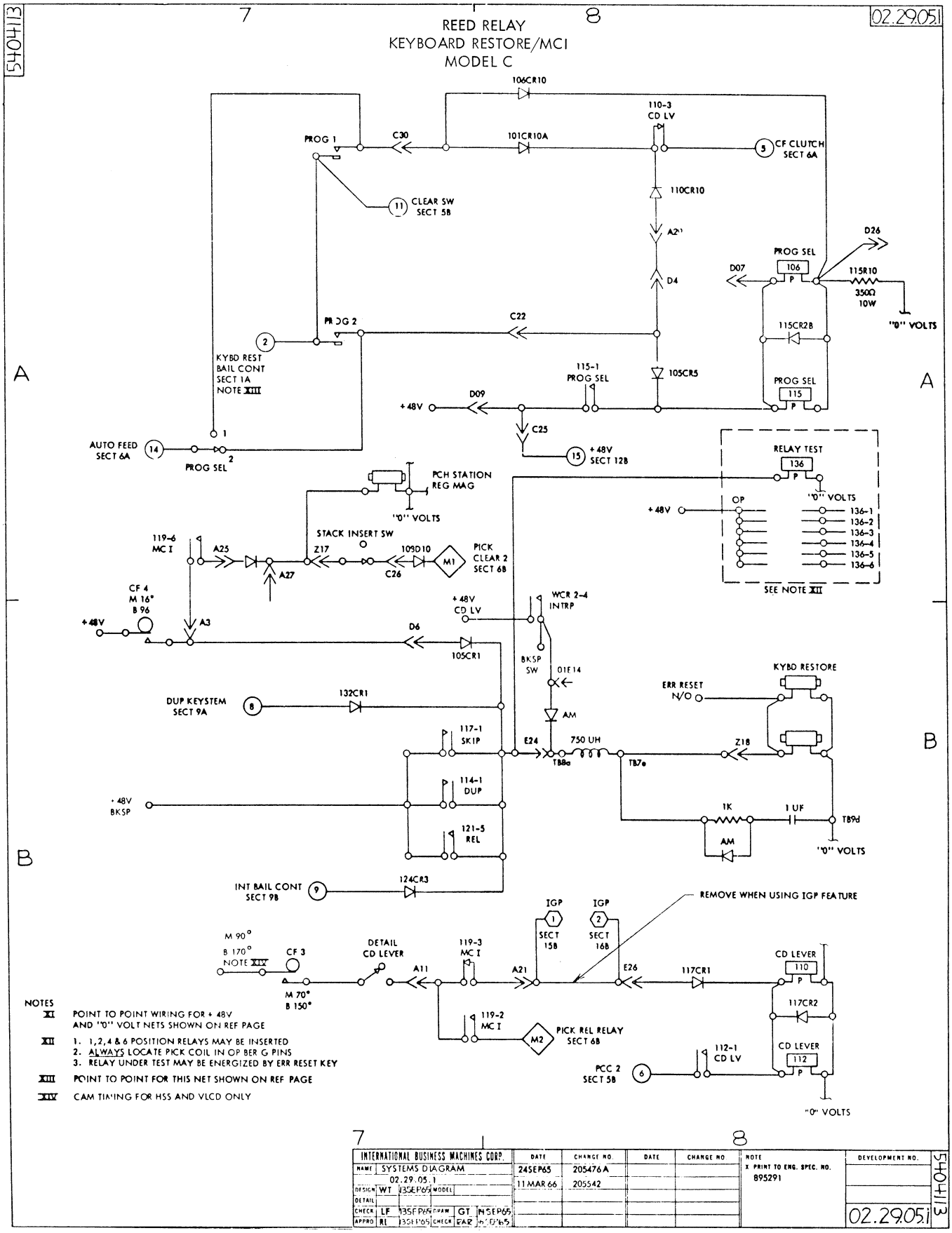
XIV CAM TIMING FOR HSS AND VLCD ONLY

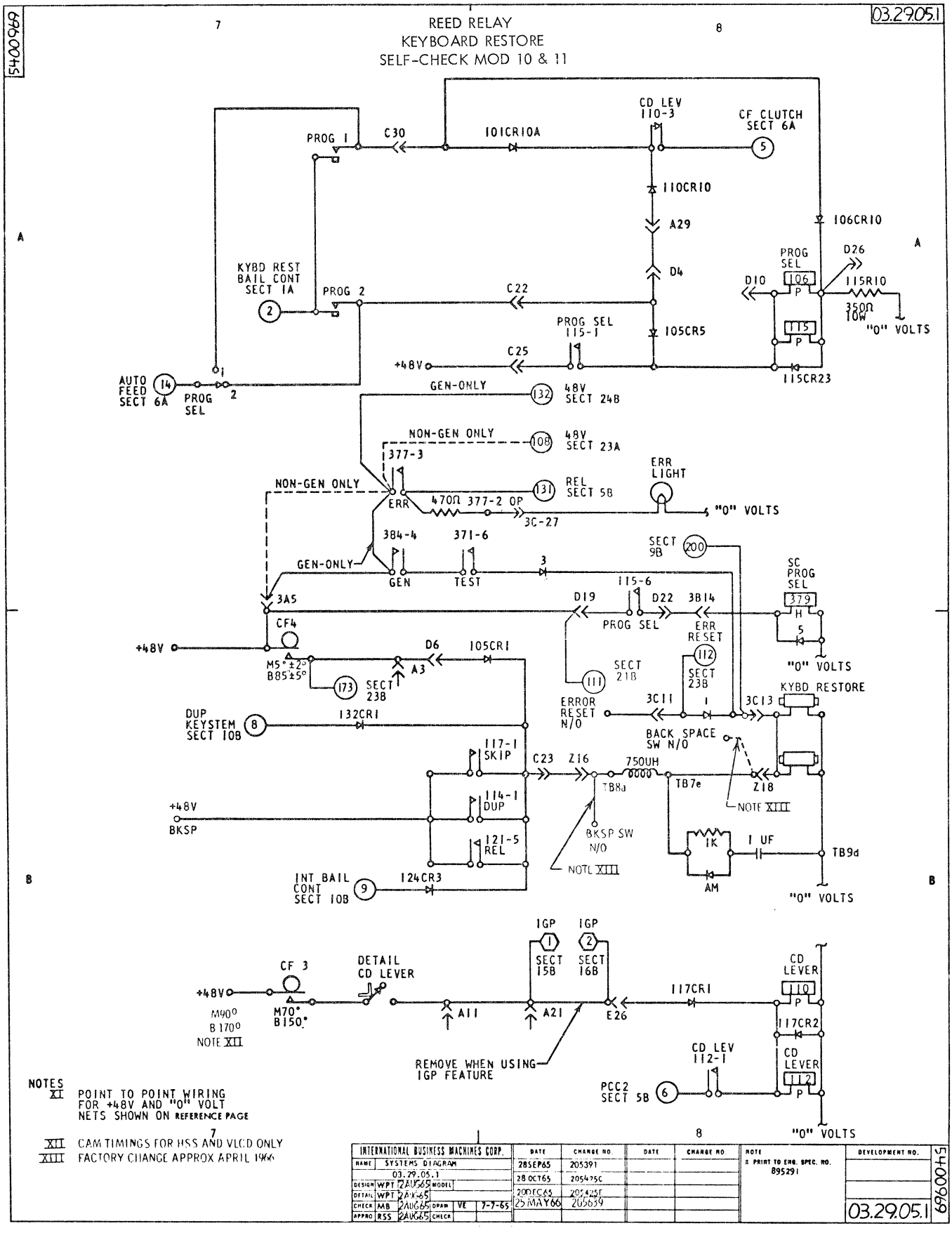
XV SEE REF PAGE FOR P/N

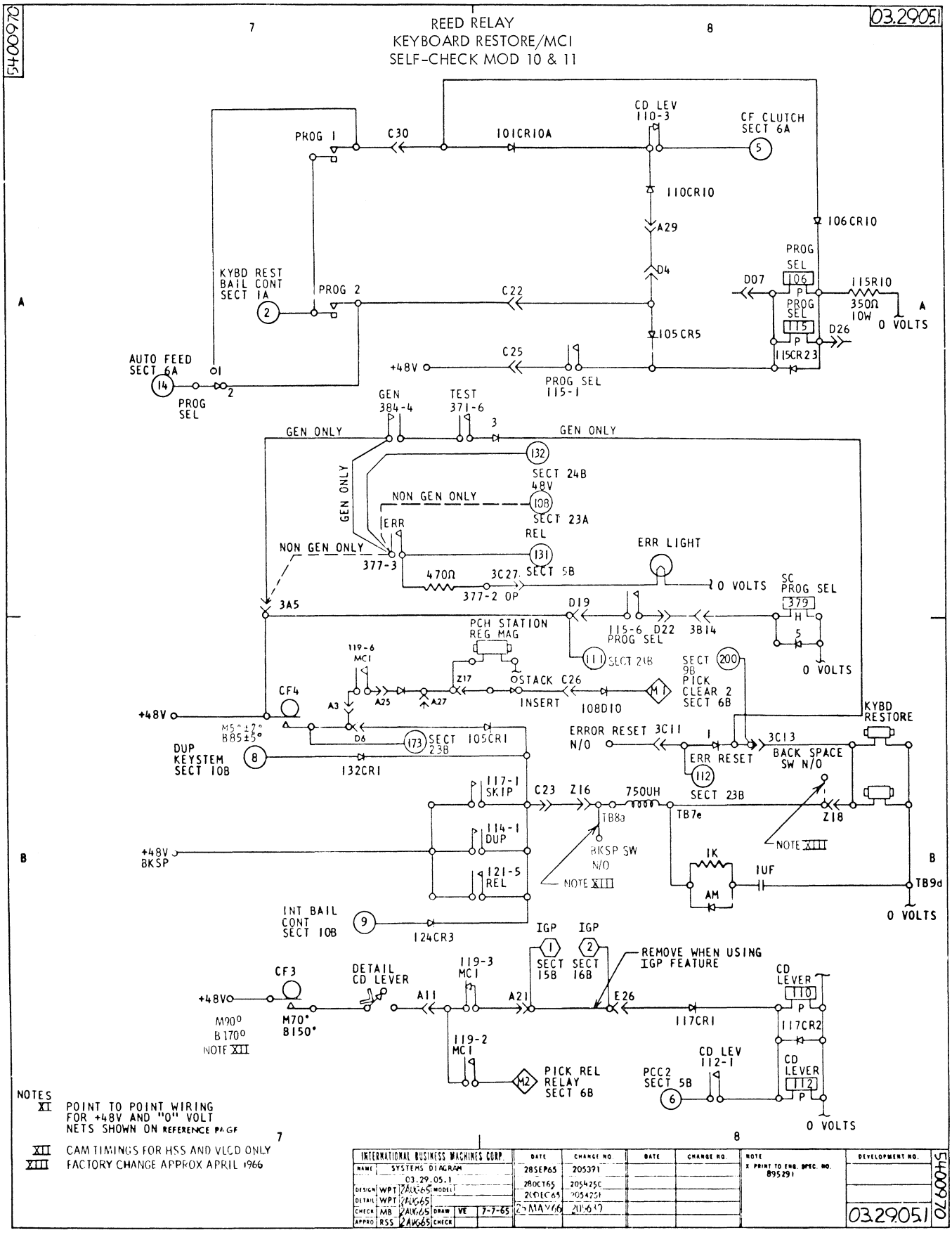
INTERNATIONAL BUSINESS MACHINES CORP.			DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM 01.29.05.1		24SEP65	205476 A			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	BF	13SEP65 MODEL	11MAR66	205542				
DETAIL	WT	13SEP65						
CHECK	RAS	13SEP65 DRAW GT 14SEP65						
APPRO	RL	13SEP65 CHECK RAS 15SEP65						01.29.05.1

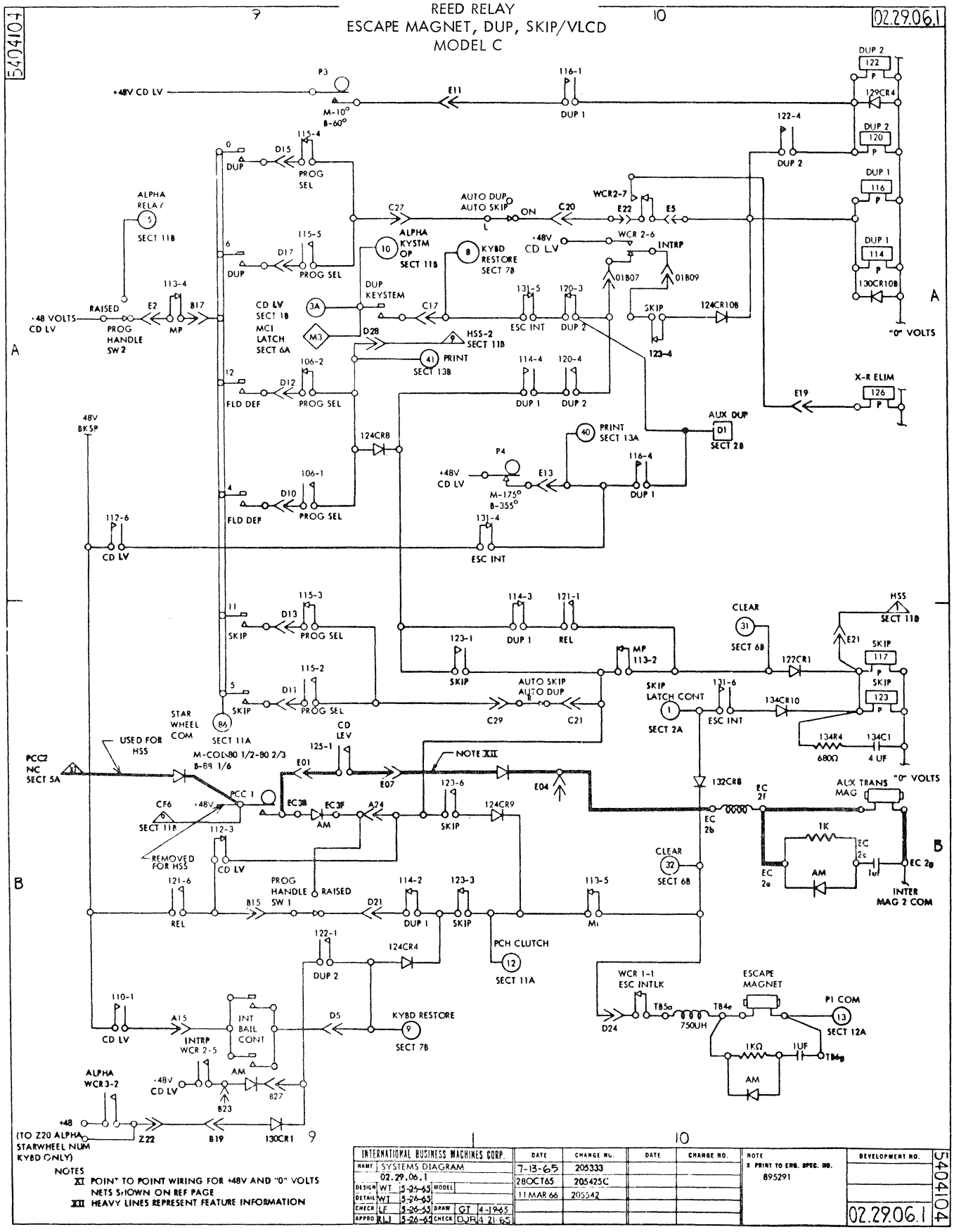
540272

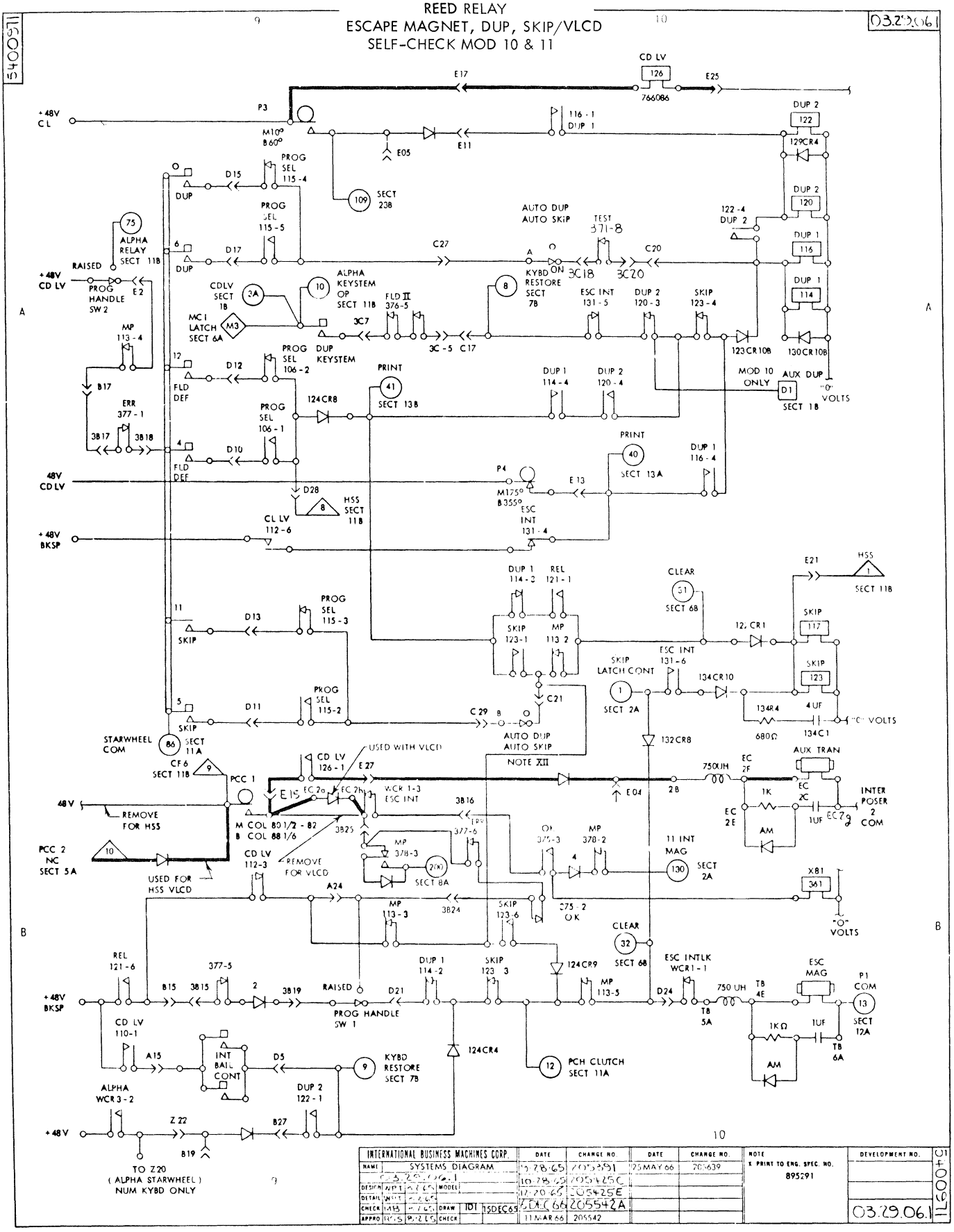

5404108
02.29.05.1
REED RELAY
KEYBOARD RESTORE
MODEL C
106CR10
CD LV 110-3
CF CLUTCH SECT 6A
PROG 1
C30
101CR10A
CLEAR SW SECT 5B
110CR10
A29
D4
PROG SEL 106
D07
D26
115R10 350Ω 10W
0 VOLTS
KYBD REST BAIL CONT SECT 1A
PROG 2
C22
115CR2B
PROG SEL 115-1
105CR5
PROG SEL 115
D09
+48V
C25
AUTO FEED SECT 6A
PROG SEL
SEE NOTE XIII
+48V SECT 12B
RELAY TEST 136
OP
136-1
136-2
136-3
136-4
136-5
136-6
SEE NOTE XII
CF4
+48V CD LV
WCR2-4 INTRP
D6
105CR1
M90° B170° NOTE XIV
M16° B96°
A3
BKSP SW N/O
E14
AM
DUP KEYSTEM SECT 9A
132CR1
ERR RESET N/O
KYBD RESTORE
117-1 SKIP
E24
750 UH
TB8a
TB7a
Z18
114-1 DUP
+48V BKS?
121-5 REL
1K
1 UF
TB9d
"0" VOLTS
AM
INT BAIL CONT SECT 9B
124CR3
VLCD CD LEV 125
IGP 1 SECT 15B
IGP 2 SECT 16B
766086 CD LEVER 110
CF 3
DETAIL CD LEVER
117CR1
M90° B170° NOTE XIV
M70° B150°
REL MC1
A11
A21
E26
117CR2
SECT 6B
REMOVE WHEN USING IGP FEATURE
CD LV 112-1
CD LEVER 112
PCC 2 SECT 5B
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE 7
XII 1. 1,2,4 & 6 POSITION RELAYS MAY BE INSERTED
2. ALWAYS LOCATE PICK COIL IN TOP BERG PIN
3. RELAY UNDER TEST MAY BE ENERGIZED BY ERR RESET KEY
XIII POINT TO POINT WIRING SHOWN ON REFERENCE PAGE
XIV CAM TIMING FOR HSS AND VLCD ONLY
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
02.29.05.1
DESIGN WT 5-26-65 MODEL
DETAIL
CHECK LF 5-26-65 DRAW VE 5-3-65
APPRO RLJ 5-26-65 CHECK
DATE CHANGE NO.
7-13-65 205333
20OCT65 205425C
11MAR66 205542
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
02.29.05.1
5404108


540413
02.29.05.1
REED RELAY
KEYBOARD RESTORE/MCI
MODEL C
106CR10
110-3 CD LV
PROG 1
C30
101CR10A
CF CLUTCH SECT 6A
CLEAR SW SECT 5B
110CR10
D26
PROG SEL 106 P
D07
115R10 350Ω 10W
"0" VOLTS
PROG 2
C22
115CR2B
KYBD REST BAIL CONT SECT 1A NOTE XIII
115-1 PROG SEL
105CR5
PROG SEL 115 P
+48V
D09
C25
AUTO FEED SECT 6A
PROG SEL
+48V SECT 12B
RELAY TEST 136 P
PCH STATION REG MAG
"0" VOLTS
OP
136-1
136-2
136-3
136-4
136-5
136-6
SEE NOTE XII
119-6 MC I
A25
STACK INSERT SW
Z17
109D10
PICK CLEAR 2 SECT 6B
M1
A27
C26
CF 4 M 16° B 96
+48V
A3
D6
105CR1
+48V CD LV
WCR 2-4 INTRP
BKSP SW
01E14
AM
KYBD RESTORE
ERR RESET N/O
DUP KEYSTEM SECT 9A
132CR1
117-1 SKIP
E24
750 UH
TB8a
TB7a
Z18
114-1 DUP
+48V BKSP
1K
1 UF
TB9d
121-5 REL
"0" VOLTS
INT BAIL CONT SECT 9B
124CR3
IGP 1 SECT 15B
IGP 2 SECT 16B
REMOVE WHEN USING IGP FEATURE
M 90°
B 170°
NOTE XIV
CF 3
DETAIL CD LEVER
119-3 MC I
A11
A21
E26
117CR1
CD LEVER 110 P
M 70°
B 150°
117CR2
119-2 MC I
M2
PICK REL RELAY SECT 6B
112-1 CD LV
CD LEVER 112 P
PCC 2 SECT 5B
"0" VOLTS
NOTES
XI POINT TO POINT WIRING FOR + 48V AND "0" VOLT NETS SHOWN ON REF PAGE
XII 1. 1,2,4 & 6 POSITION RELAYS MAY BE INSERTED
2. ALWAYS LOCATE PICK COIL IN OP BER G PINS
3. RELAY UNDER TEST MAY BE ENERGIZED BY ERR RESET KEY
XIII POINT TO POINT FOR THIS NET SHOWN ON REF PAGE
XIV CAM TIMING FOR HSS AND VLCD ONLY
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
02.29.05.1
DESIGN WT 13SEP65 MODEL
DETAIL
CHECK LF 13SEP65 DRAWN GT 14SEP65
APPRO RL 13SEP65 CHECK EAR 15SEP65
DATE 24SEP65 CHANGE NO. 205476A
DATE 11MAR66 CHANGE NO. 205542
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
02.29.05.1
540413

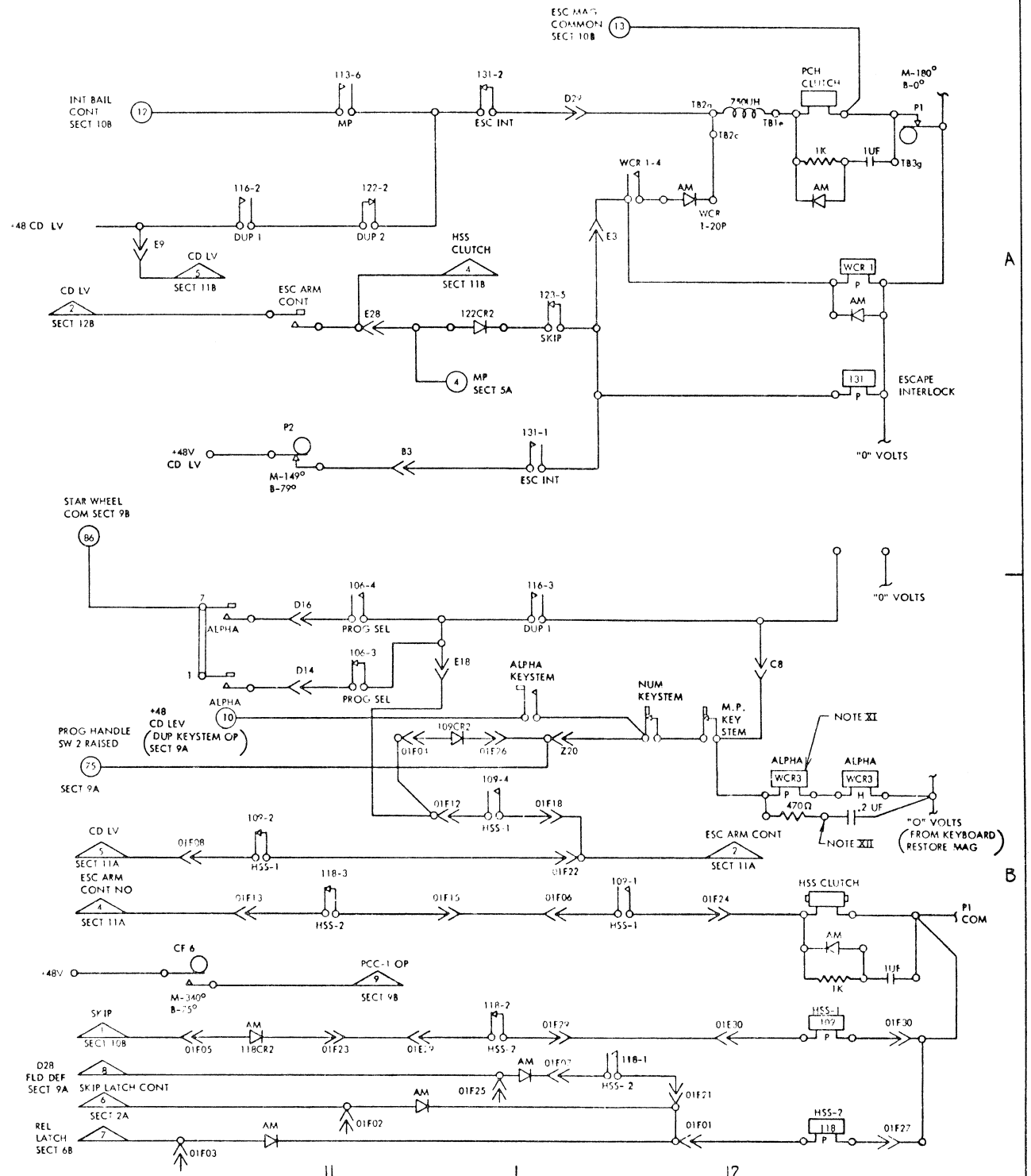

03.29.05.1
6960045
REED RELAY
KEYBOARD RESTORE
SELF-CHECK MOD 10 & 11
PROG 1
C30
101CR10A
CD LEV 110-3
CF CLUTCH SECT 6A
110CR10
A29
106CR10
D4
PROG SEL
D26
D10
106 P
115R10
350Ω 10W
"0" VOLTS
KYBD REST BAIL CONT SECT 1A
PROG 2
C22
105CR5
PROG SEL 115-1
115 P
C25
+48V
115CR23
AUTO FEED SECT 6A
PROG SEL
GEN-ONLY
132
48V SECT 24B
NON-GEN ONLY
108
48V SECT 23A
377-3
ERR LIGHT
NON-GEN ONLY
ERR
131
REL SECT 5B
470Ω 377-2 OP
3C-27
"0" VOLTS
384-4
371-6
SECT 9B
200
GEN-ONLY
GEN
TEST
3
115-6
SC PROG SEL
379 H
3A5
D19
D22
3B14
PROG SEL
ERR RESET
5
CF4
+48V
D6
105CR1
M5°±2°
B85±5°
A3
173
SECT 23B
SECT 21B
111
112
SECT 23B
"0" VOLTS
KYBD RESTORE
ERROR RESET N/O
3C11
1
3C13
DUP KEYSTEM SECT 10B
8
132CR1
BACK SPACE SW N/O
117-1 SKIP
C23
Z16
750UH
TB8a
TB7e
Z18
NOTE XIII
+48V
BKSP
114-1 DUP
121-5 REL
BKSP SW N/O
NOTE XIII
1K
1 UF
TB9d
AM
"0" VOLTS
INT BAIL CONT SECT 10B
9
124CR3
IGP 1
IGP 2
SECT 15B
SECT 16B
CF 3
DETAIL CD LEVER
CD LEVER 110 P
+48V
M90°
B 170°
NOTE XII
M70°
B150°
A11
A21
E26
117CR1
117CR2
REMOVE WHEN USING IGP FEATURE
CD LEV 112-1
CD LEVER 112 P
PCC2 SECT 5B
6
"0" VOLTS
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
XII CAM TIMINGS FOR HSS AND VLCD ONLY
XIII FACTORY CHANGE APPROX APRIL 1966
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.05.1
DESIGN WPT 2AUG65 MODEL
DETAIL WPT 2AUG65
CHECK MB 2AUG65 DRAW VE 7-7-65
APPRO RSS 2AUG65 CHECK
DATE CHANGE NO.
28SEP65 205391
28OCT65 205425C
20DEC65 205425E
25MAY66 205639
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.05.1
6960045


5400970
03.29051
REED RELAY
KEYBOARD RESTORE/MCI
SELF-CHECK MOD 10 & 11
PROG 1
C30
101CR10A
CD LEV 110-3
CF CLUTCH SECT 6A
110CR10
A29
106CR10
PROG SEL 106
D07
115R10 350Ω 10W
0 VOLTS
KYBD REST BAIL CONT SECT 1A
PROG 2
C22
D4
105CR5
PROG SEL 115
D26
115CR23
C25
+48V
PROG SEL 115-1
AUTO FEED SECT 6A
PROG SEL
GEN 384-4
TEST 371-6
GEN ONLY
NON GEN ONLY
SECT 24B 48V
SECT 23A
ERR REL
377-3
470Ω
3C27
377-2 OP
SECT 5B
ERR LIGHT
SC PROG SEL 379
3A5
D19
115-6 PROG SEL
D22
3B14
PCH STATION REG MAG
119-6 MCI
SECT 21B
SECT 9B PICK CLEAR 2 SECT 6B
CF4
Z17
OSTACK C26
INSERT
108D10
M1
A3
A25
A27
+48V
DUP KEYSTEM SECT 10B
D6
SECT 23B
105CR1
132CR1
KYBD RESTORE
ERROR RESET 3C11
N/O
3C13
ERR RESET
BACK SPACE SW N/O
SECT 23B
117-1 SKIP
C23
Z16
750UH
TB8a
TB7e
Z18
NOTE XIII
114-1 DUP
+48V BKSP
BKSP SW N/O
NOTE XIII
121-5 REL
1K
1UF
AM
TB9d
0 VOLTS
INT BAIL CONT SECT 10B
124CR3
IGP 1
IGP 2
SECT 15B
SECT 16B
REMOVE WHEN USING IGP FEATURE
CF3
DETAIL CD LEVER
119-3 MCI
A11
A21
E26
117CR1
CD LEVER 110
117CR2
+48V
M90° B170° NOTE XII
M70° B150°
119-2 MCI
M2
PICK REL RELAY SECT 6B
PCC2 SECT 5B
CD LEV 112-1
CD LEVER 112
0 VOLTS
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
XII CAM TIMINGS FOR HSS AND VLCD ONLY
XIII FACTORY CHANGE APPROX APRIL 1966
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.05.1
DESIGN WPT 2AUG65 MODEL
DETAIL WPT 2AUG65
CHECK MB 2AUG65 DRAW VE 7-7-65
APPRO RSS 2AUG65 CHECK
DATE CHANGE NO.
28SEP65 205391
28OCT65 205425C
20DEC65 205425H
2-MAY66 205617
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5400970
03.29051


REED RELAY
ESCAPE MAGNET, DUP, SKIP/VLCD
MODEL C
02.29.06.1
5404104
+48V CD LV
DUP 1
DUP 2
PROG SEL
ALPHA RELAY
AUTO DUP
AUTO SKIP
ALPHA KYSTM OP SECT 11B
KYBD RESTORE SECT 7B
WCR2-7
WCR 2-6
INTRP
DUP KEYSTEM
CD LV SECT 1B MCI LATCH SECT 6A
HSS-2 SECT 11B
PRINT SECT 13B
PRINT SECT 13A
AUX DUP
X-R ELIM
"0" VOLTS
+48 VOLTS CD LV
RAISED PROG HANDLE SW 2
ESC INT
FLD DEF
48V BKSP
124CR8
124CR10B
130CR10B
129CR4
124CR4
122CR1
132CR8
124CR9
SKIP
SKIP LATCH CONT
CLEAR
HSS SECT 11B
STAR WHEEL COM
USED FOR HSS
REMOVED FOR HSS
PCC2 NC SECT 5A
PCC 1
M-COL-80 1/2-80 2/3 B-89 1/6
NOTE XII
AUX TRANS MAG
INTER MAG 2 COM
PROG HANDLE RAISED SW 1
PCH CLUTCH
WCR 1-1 ESC INTLK
ESCAPE MAGNET
P1 COM
INT BAIL CONT
ALPHA WCR3-2
(TO Z20 ALPHA STARWHEEL NUM KYBD ONLY)
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLTS NETS SHOWN ON REF PAGE
XII HEAVY LINES REPRESENT FEATURE INFORMATION
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
02.29.06.1
DESIGN WT 5-24-65
DETAIL WT 5-26-65
CHECK LF 5-26-65
APPRO RLJ 5-26-65
DRAW GT 4-1965
CHECK DJR 4 21 65
DATE CHANGE NO.
7-13-65 205333
28OCT65 205425C
11 MAR 66 205542
NOTE X PRINT TO ERG. SPEC. NO. 895291
DEVELOPMENT NO. 5404104
02.29.06.1


REED RELAY
ESCAPE MAGNET, DUP, SKIP/VLCD
SELF-CHECK MOD 10 & 11
03.29.06.1
1540911
CD LV
126
766086
E17
E25
+48V CL
P3
M10° B60°
E05
E11
116 - 1 DUP 1
DUP 2
122
129CR4
DUP 2
120
122 - 4 DUP 2
DUP 1
116
DUP 1
114
PROG SEL 115 - 4
D15
DUP
109
SECT 23B
PROG SEL 115 - 5
D17
C27
AUTO DUP AUTO SKIP
TEST 371-8
C20
3C18
3C20
KYBD RESTORE SECT 7B
ON
ESC INT 131 - 5
DUP 2 120 - 3
SKIP 123 - 4
123CR10B
130CR10B
75
ALPHA RELAY SECT 11B
RAISED
+48V CD LV
PROG HANDLE SW 2
E2
CDLV SECT 1B
2A
10
ALPHA KEYSTEM OP SECT 11B
8
FLD II 376-5
3C7
3C - 5 C17
MC1 LATCH SECT 6A
M3
MP 113 - 4
B17
ERR 377 - 1
3B17
3B18
PROG SEL 106 - 2
D12
FLD DEF
PROG DUP KEYSTEM
PRINT
41
SECT 13B
124CR8B
DUP 1 114 - 4
DUP 2 120 - 4
MOD 10 ONLY
AUX DUP
D1
SECT 1B
"0" VOLTS
PROG SEL 106 - 1
D10
FLD DEF
PRINT
40
SECT 13A
DUP 1 116 - 4
48V CD LV
P4
M175° B355°
E13
ESC INT 131 - 4
D28
8
HSS SECT 11B
CL LV 112 - 6
+48V BKSP
DUP 1 114 - 2
REL 121 - 1
CLEAR
31
SECT 6B
E21
HSS
1
SECT 11B
PROG SEL 115 - 3
D13
SKIP
SKIP 123 - 1
MP 113 2
12 CR1
SKIP 117
SKIP 123
ESC INT 131 - 6
SKIP LATCH CONT
1
SECT 2A
134CR10
134R4
680Ω
4UF
134C1
"0" VOLTS
PROG SEL 115 - 2
D11
C29
C21
AUTO DUP AUTO SKIP
NOTE XII
132CR8
STARWHEEL COM
86
SECT 11A
CF6 SECT 11B
9
PCC 1
USED WITH VLCD
CD LV 126 - 1
E27
E04
750UH
AUX TRAN
EC 2F
EC 2E
1K
EC 2C
1UF
EC 2g
INTER POSER 2 COM
AM
48V
REMOVE FOR HSS
E15
EC 2a
EC 2h
VCR 1-3 ESC INT
3B16
3B25
M COL 80 1/2 - 82
B COL 88 1/6
REMOVE FOR VLCD
MP 378-3
200
SECT 8A
MP 378-2
11 INT MAG
130
SECT 2A
PCC 2 NC SECT 5A
10
USED FOR HSS VLCD
CD LV 112-3
A24
MP 113-3
3B24
SKIP 123-6
275 - 2 OK
X81
361
"0" VOLTS
CLEAR
32
SECT 6B
REL 121 - 6
377-5
DUP 1 114-2
SKIP 123 3
124CR9
MP 113-5
ESC INTLK WCR1 - 1
ESC MAG
P1 COM
13
SECT 12A
+48V BKSP
B15
3B15
2
3B19
RAISED
PROG HANDLE SW 1
D21
D24
750 UH
TB 4E
TB 5A
1KΩ
1UF
TB 6A
AM
CD LV 110-1
A15
INT BAIL CONT
D5
9
KYBD RESTORE SECT 7B
124CR4
12
PCH CLUTCH SECT 11A
ALPHA WCR3 - 2
DUP 2 122 - 1
+48V
Z22
B27
B19
TO Z20
(ALPHA STARWHEEL)
NUM KYBD ONLY
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
03.29.06.1
DESIGN APT
DETAIL WOT
CHECK MB
APPRO RCS
DRAW 101
CHECK
15DEC65
DATE
10-78-65
10-78-65
12-20-65
6DEC66
11MAR66
CHANGE NO.
205391
205425C
205425E
205542A
205542
DATE
25MAY66
CHANGE NO.
205639
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.06.1
01 of 01

REED RELAY
PUNCH CLUTCH/HSS
MODEL A



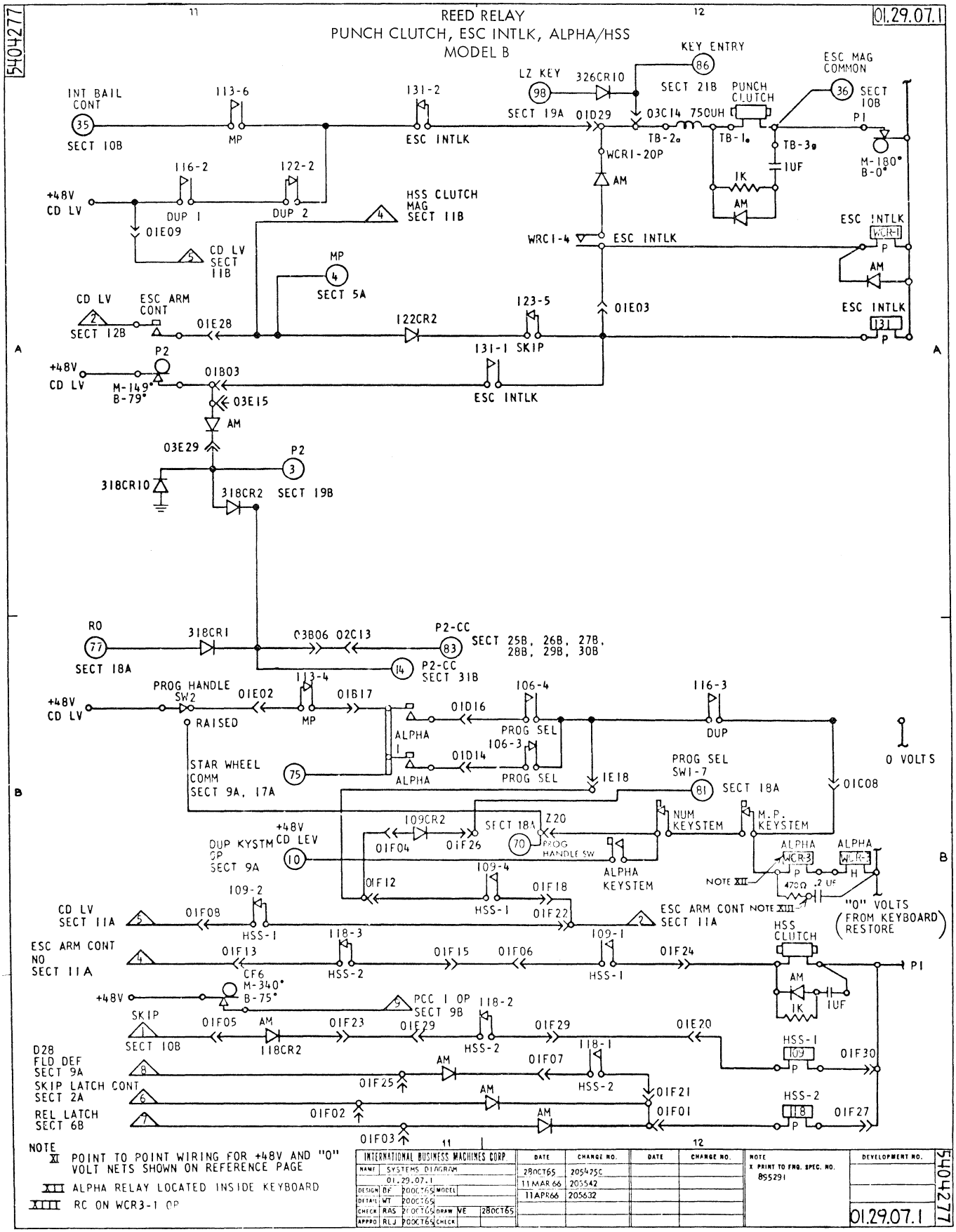
NOTES

XI ALPHA RELAY LOCATED INSIDE KEYBOARD

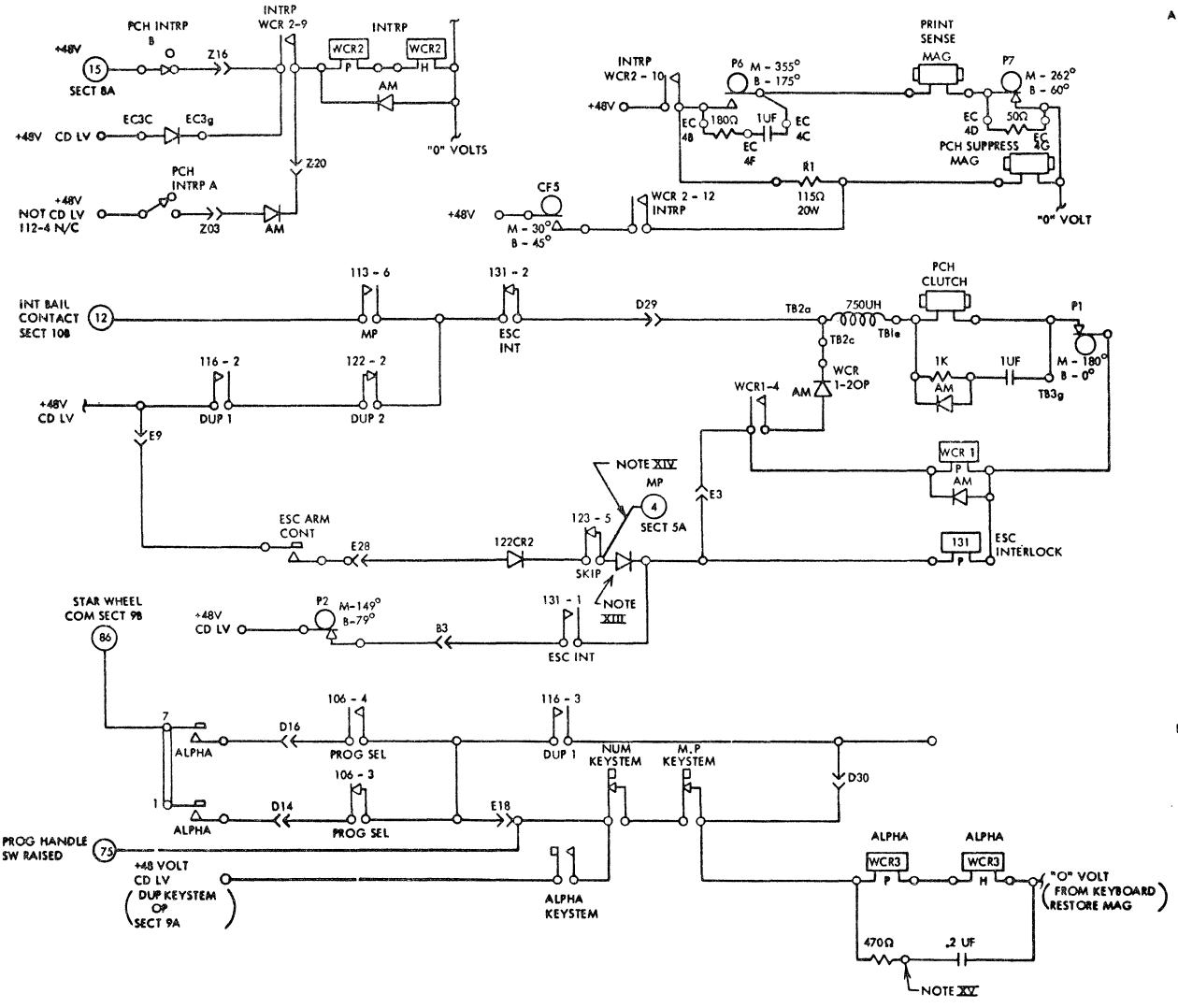
XII RC ON WCR3 - 1 OP

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			7-2-65	205397			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	WL 5-27-65	MODEL		28OCT65	207425C				
DETAIL	00.27.07.1			11MAR66	205542				
CHECK	LF 5-25-65	DRAW	GT 4TRAS	11APR66	205632				00.29.07.1
APPRO	MB 5-25-65	CHECK	ROUTINE CHECK						

537570


5404277
REED RELAY
PUNCH CLUTCH, ESC INTLK, ALPHA/HSS
MODEL B
01.29.07.1
KEY ENTRY
LZ KEY
326CR10
SECT 21B
PUNCH CLUTCH
ESC MAG COMMON
INT BAIL CONT
SECT 10B
113-6
MP
131-2
ESC INTLK
SECT 19A
01D29
03C14 750UH
TB-2a
TB-1a
TB-3a
P1
M-180° B-0°
WCR1-20P
AM
1K
1UF
116-2
122-2
+48V CD LV
DUP 1
DUP 2
HSS CLUTCH MAG SECT 11B
01E09
CD LV SECT 11B
WRC1-4
ESC INTLK
WCR-1
P
MP
SECT 5A
CD LV
ESC ARM CONT
SECT 12B
01E28
122CR2
123-5
01E03
131-1 SKIP
P2
M-149° B-79°
01B03
03E15
03E29
318CR10
318CR2
SECT 19B
RO
SECT 18A
318CR1
03B06 02C13
P2-CC
SECT 25B, 26B, 27B, 28B, 29B, 30B
SECT 31B
PROG HANDLE SW2
01E02
113-4
01B17
106-4
01D16
116-3
RAISED
ALPHA
PROG SEL
DUP
0 VOLTS
STAR WHEEL COMM SECT 9A, 17A
75
01D14
106-3
1E18
PROG SEL SW1-7
81
01C08
109CR2
SECT 18A
Z20
01F04
01F26
70
PROG HANDLE SW
NUM KEYSTEM
M.P. KEYSTEM
ALPHA KEYSTEM
ALPHA WCR-3
DUP KYSTM OP SECT 9A
+48V CD LEV
10
01F12
109-4
01F18
HSS-1
109-2
01F08
01F22
CD LV SECT 11A
ESC ARM CONT NOTE XIII
SECT 11A
"0" VOLTS (FROM KEYBOARD RESTORE)
ESC ARM CONT NO SECT 11A
01F13
118-3
HSS-2
CF6
01F15
01F06
109-1
01F24
HSS CLUTCH
M-340° B-75°
PCC 1 OP SECT 9B
118-2
SKIP
SECT 10B
01F05
118CR2
01F23
01E29
01F29
01E20
118-1
01F07
01F30
D28 FLD DEF SECT 9A
SKIP LATCH CONT SECT 2A
REL LATCH SECT 6B
01F25
01F21
01F02
01F01
01F03
01F27
NOTE
XII POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
XIII ALPHA RELAY LOCATED INSIDE KEYBOARD
XIII RC ON WCR3-1 OP
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
01.29.07.1
DESIGN DF 20OCT65 MODEL
DETAIL WT 20OCT65
CHECK RAS 21OCT65 DRAW VE 28OCT65
APPRO RLJ 20OCT65 CHECK
DATE CHANGE NO.
28OCT65 2054750
11MAR66 205542
11APR66 205632
NOTE X PRINT TO ENG. SPEC. NO. 855291
DEVELOPMENT NO.
5404277
01.29.07.1

REED RELAY
PUNCH CLUTCH
MODEL C



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

XII

XIII ADDED DIODE P/N 2111232 OR 2391158

XIV ADDED WIRE ON CARD

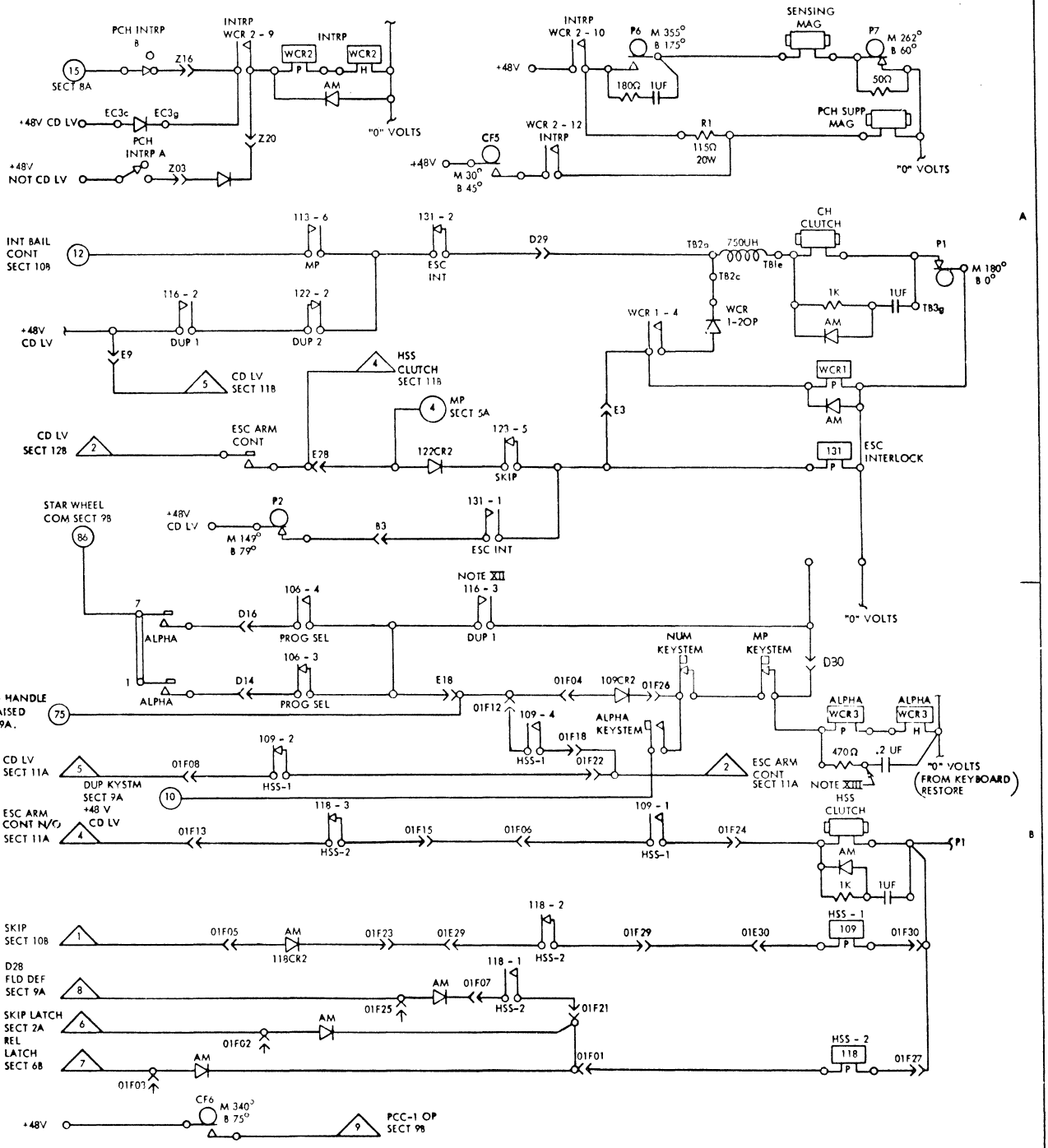
XV RC ON WCR3 - 1 OP

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					13JUL65	205333			X PRINT TO ENG. SPEC. NO. 895291	
	02.29.07.1					28OCT65	205425C				
DESIGN	WT	5-26-65	MODEL			11APR66	205632				
DETAIL											02.29.07.1
CHECK	LF	5-26-65	DRAW	CDA	9-27-65						
APPRD	RLJ	5-26-65	CHECK	FP	9.29.65						

540105

02.29.07.1

REED RELAY
PUNCH CLUTCH/HSS
MODEL C



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

XII THIS POINT USED ON MODEL B

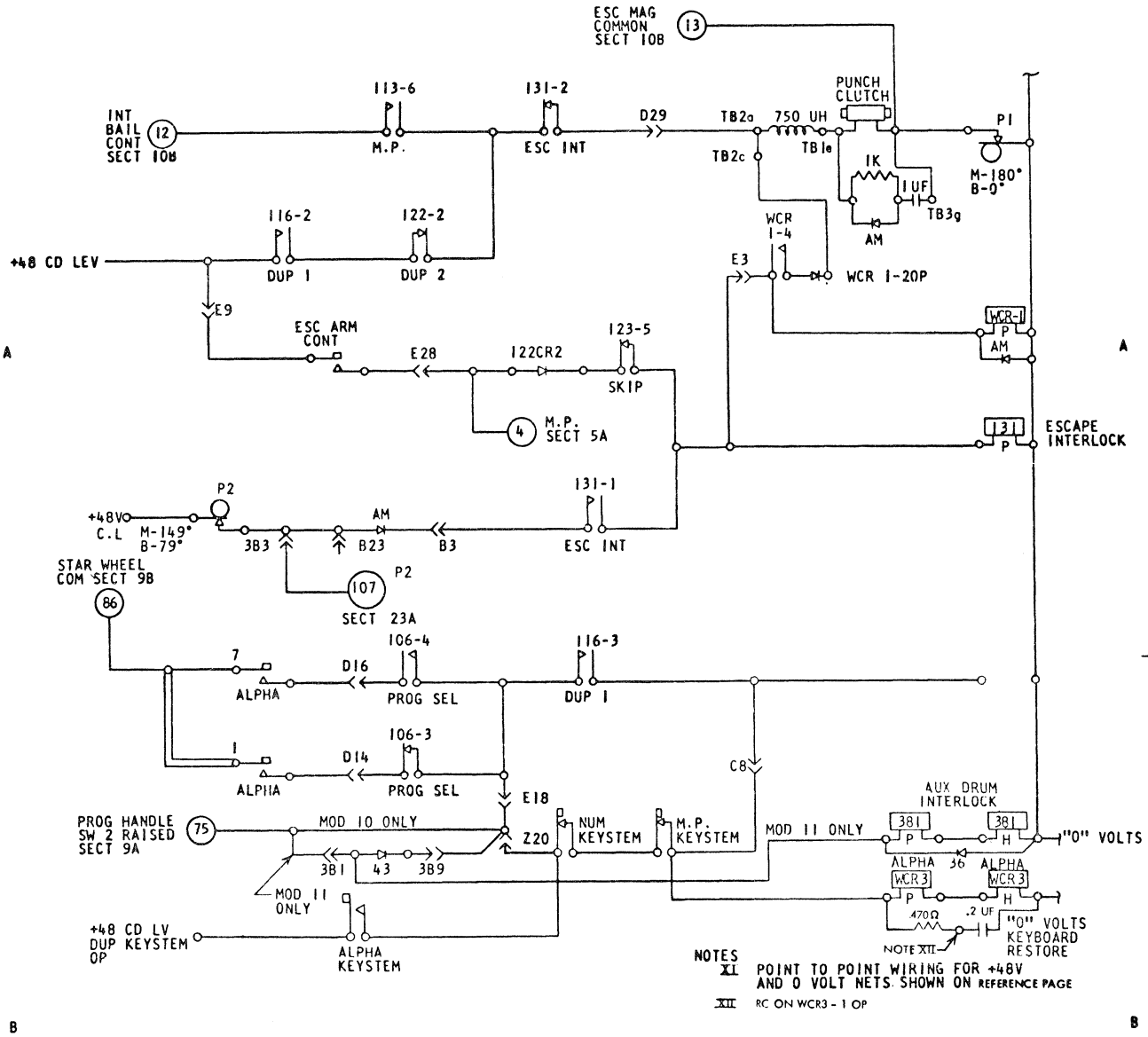
XIII RC ON WCR3 - 1 OP

INTERNATIONAL BUSINESS MACHINES CORP.													
NAME	SYSTEMS DIAGRAM 02.29.07.1							DATE	CHANGE NO	DATE	CHANGE NO.	NOTE X PRINT TO ENG. SPEC. NO. 895291	DEVELOPMENT NO.
DESIGN	WT	20OCT65	MODEL					20OCT65	205475C				
DETAIL								11APR66	205632				
CHECK	LF	20OCT65	DRAW	CDA	19-22-65								
APPRO	RLJ	20OCT65	CHECK	FL	19-22-65								02.29.07.1

5404276

03.29.07.1

REED RELAY
PUNCH CLUTCH
SELF-CHECK MOD 10 & 11



NOTES

XI POINT TO POINT WIRING FOR +48V AND 0 VOLT NETS SHOWN ON REFERENCE PAGE

XII RC ON WCR3 - 1 OP

INTERNATIONAL BUSINESS MACHINES CORP.						
NAME	SYSTEMS DIAGRAM					
	03.29.07.1					
DESIGN	WPT	2AUG65	MODEL			
DETAIL	WPT	2AUG65				
CHECK	MB	2AUG65	DRAW	VE	7-7-65	
APPRO	RSS	2AUG65	CHECK			

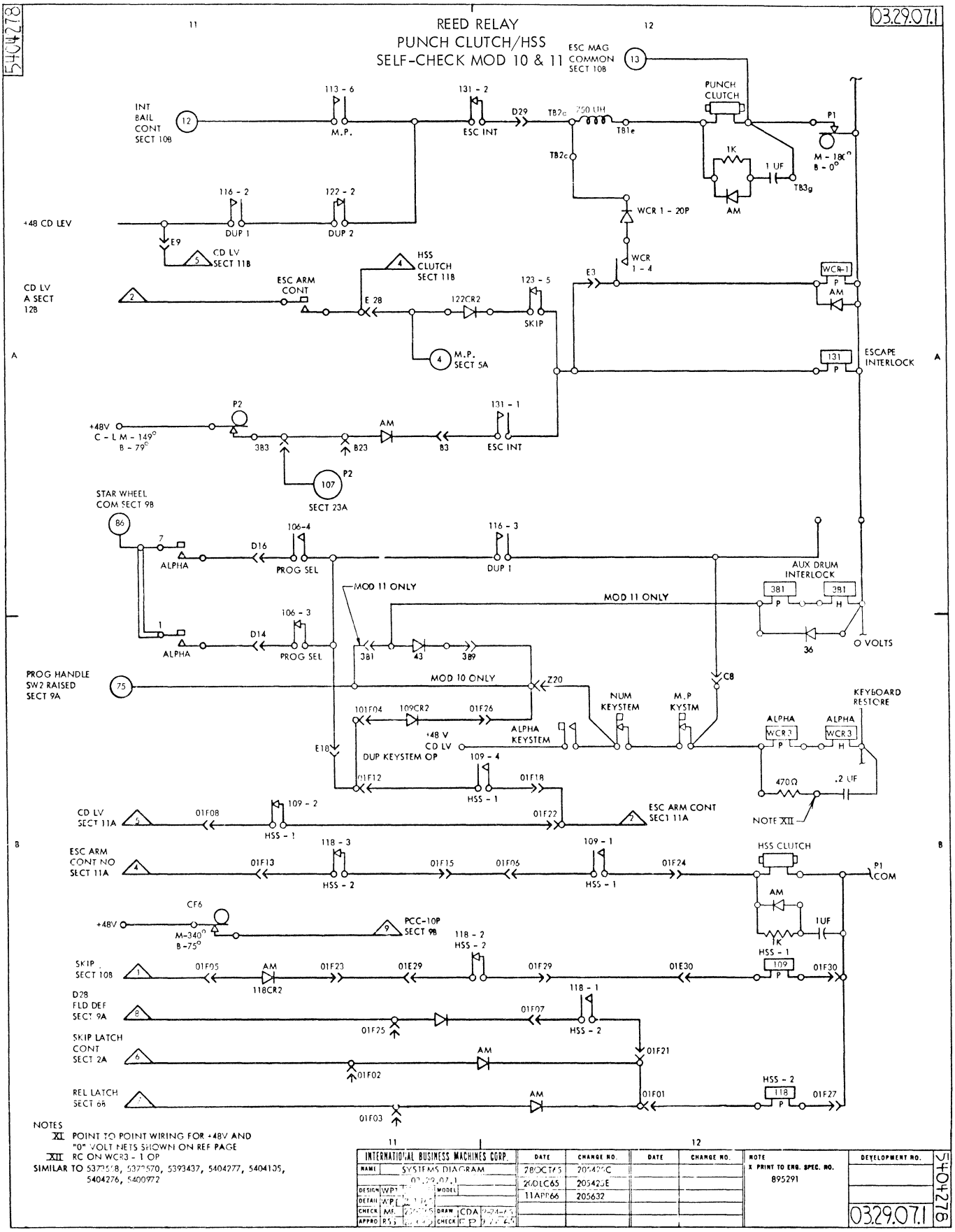
DATE	CHANGE NO.	DATE	CHANGE NO.
28SEP65	205391		
28OCT65	205425C		
20DEC65	205425E		
11APR66	205632		

NOTE
X PRINT TO ENG. SPEC. NO. 895291

DEVELOPMENT NO.

03.29.07.1

5400972

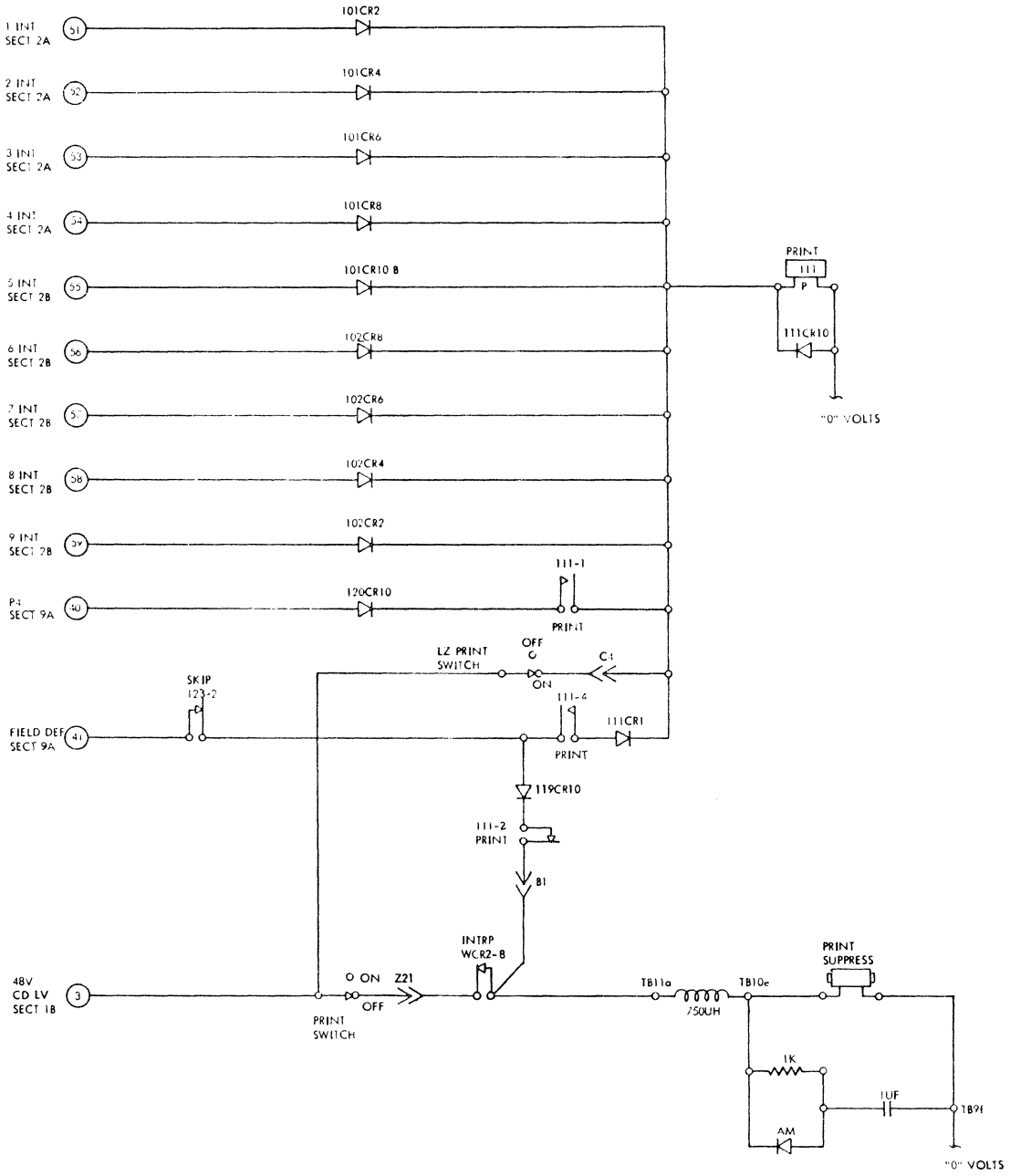

5404278
03.29.07.1
REED RELAY
PUNCH CLUTCH/HSS
SELF-CHECK MOD 10 & 11
ESC MAG COMMON SECT 10B
INT BAIL CONT SECT 10B
M.P.
ESC INT
D29
TB2c
750 UH
TB1e
PUNCH CLUTCH
P1
M - 18°
B - 0°
1K
1 UF
TB3g
AM
TB2c
WCR 1 - 20P
WCR 1 - 4
+48 CD LEV
DUP 1
DUP 2
E9
CD LV SECT 11B
HSS CLUTCH SECT 11B
CD LV A SECT 12B
ESC ARM CONT
E 28
122CR2
SKIP
E3
WCR-1
M.P. SECT 5A
ESCAPE INTERLOCK
+48V
C - L M - 149°
B - 79°
383
B23
B3
ESC INT
P2
107
SECT 23A
STAR WHEEL COM SECT 9B
B6
ALPHA
D16
PROG SEL
106-4
116 - 3
DUP 1
AUX DRUM INTERLOCK
381
MOD 11 ONLY
D14
106 - 3
43
389
36
O VOLTS
PROG HANDLE SW2 RAISED SECT 9A
MOD 10 ONLY
Z20
C8
NUM KEYSTEM
M.P KYSTM
KEYBOARD RESTORE
ALPHA WCR 3
101F04
109CR2
01F26
+48 V CD LV
ALPHA KEYSTEM
E18
DUP KEYSTEM OP
109 - 4
01F12
01F18
HSS - 1
470Ω
.2 UF
NOTE XII
CD LV SECT 11A
01F08
109 - 2
01F22
ESC ARM CONT SECT 11A
ESC ARM CONT NO SECT 11A
01F13
118 - 3
HSS - 2
01F15
01F06
109 - 1
01F24
HSS CLUTCH
P1 COM
CF6
+48V
M-340°
B-75°
PCC-10P SECT 9B
118 - 2
SKIP SECT 10B
01F05
118CR2
01F23
01E29
01F29
01E30
01F30
D28 FLD DEF SECT 9A
118 - 1
01F07
01F25
SKIP LATCH CONT SECT 2A
01F21
01F02
REL LATCH SECT 6B
01F01
01F03
HSS - 2
118
01F27
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
XII RC ON WCR3 - 1 OP
SIMILAR TO 5375578, 5375570, 5393437, 5404277, 5404135, 5404276, 5400972
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.07.1
DESIGN WP
DETAIL APL
CHECK MF
APPRO RSS
MODEL
DRAW CDA
CHECK EP
DATE
CHANGE NO.
28OCT65 20542DC
20DEC65 20542DE
11APR66 205632
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5404278
03.29.07.1

5404106

13 | 14

02.29.08.1

REED RELAY PRINT FEATURE MODEL C



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

13 | 14

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM 02.29.08.1			7-13-65	205333			X PRINT TO ENG. SPEC. NO.	
DESIGN	W1	5-26-65	MODEL	28OCT65	205425C				
DETAIL									
CHECK	LF	5-26-65	DRAW	GT 4-19-65					02.29.08.1
APPRO	RLJ	5-26-65	CHECK	[illegible]					

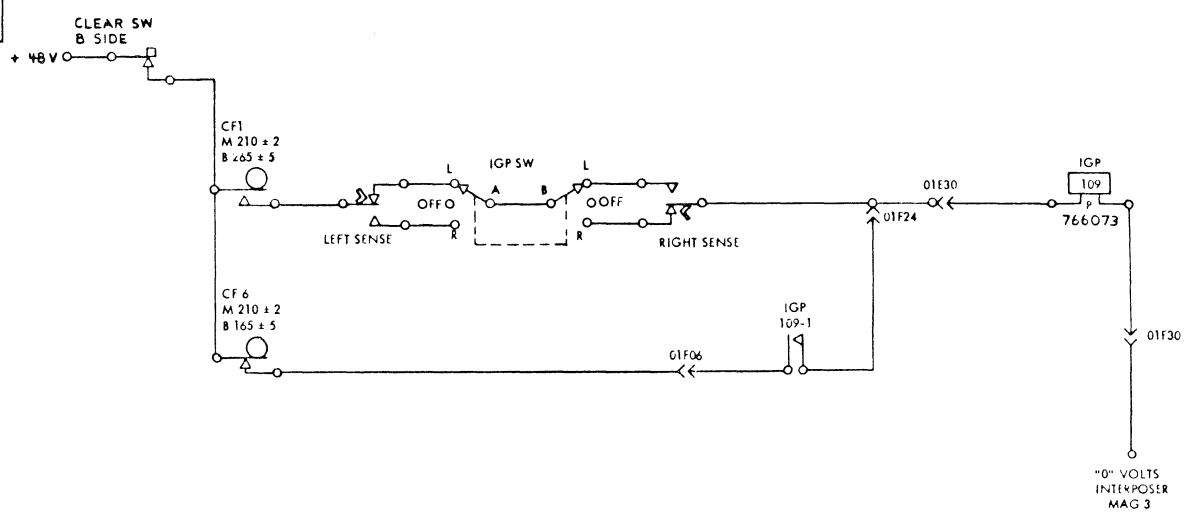
5404106

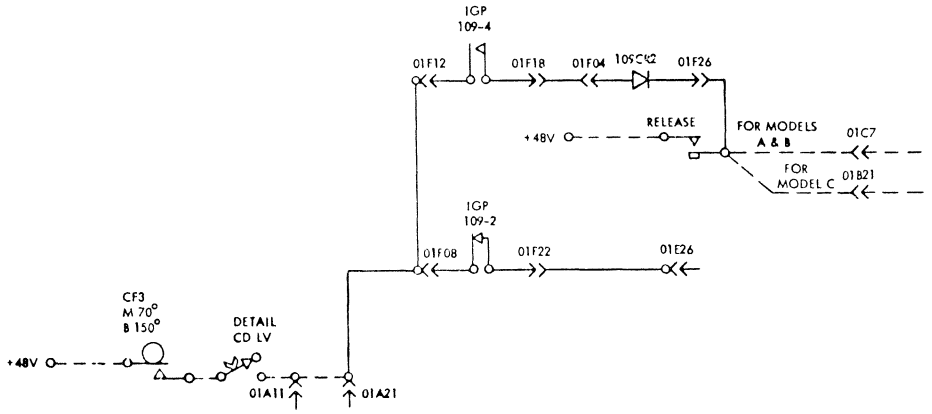
5373569

15 16

00.29.08.2

REED RELAY
INTERSPERSED GANG PUNCH





PART NAME	PART NUMBER
CAM CF1	31[illegible]85
CAM CF6	22[illegible]94
RELAY 109	76[illegible]73
SWITCH IGP	3e[illegible]97
SWITCH ASM RIGHT SENSE	54[illegible]26
SWITCH ASM LEFT SENSE	54[illegible]26
109 CR 2	2391158
CLEAR SW	725348

NOTES

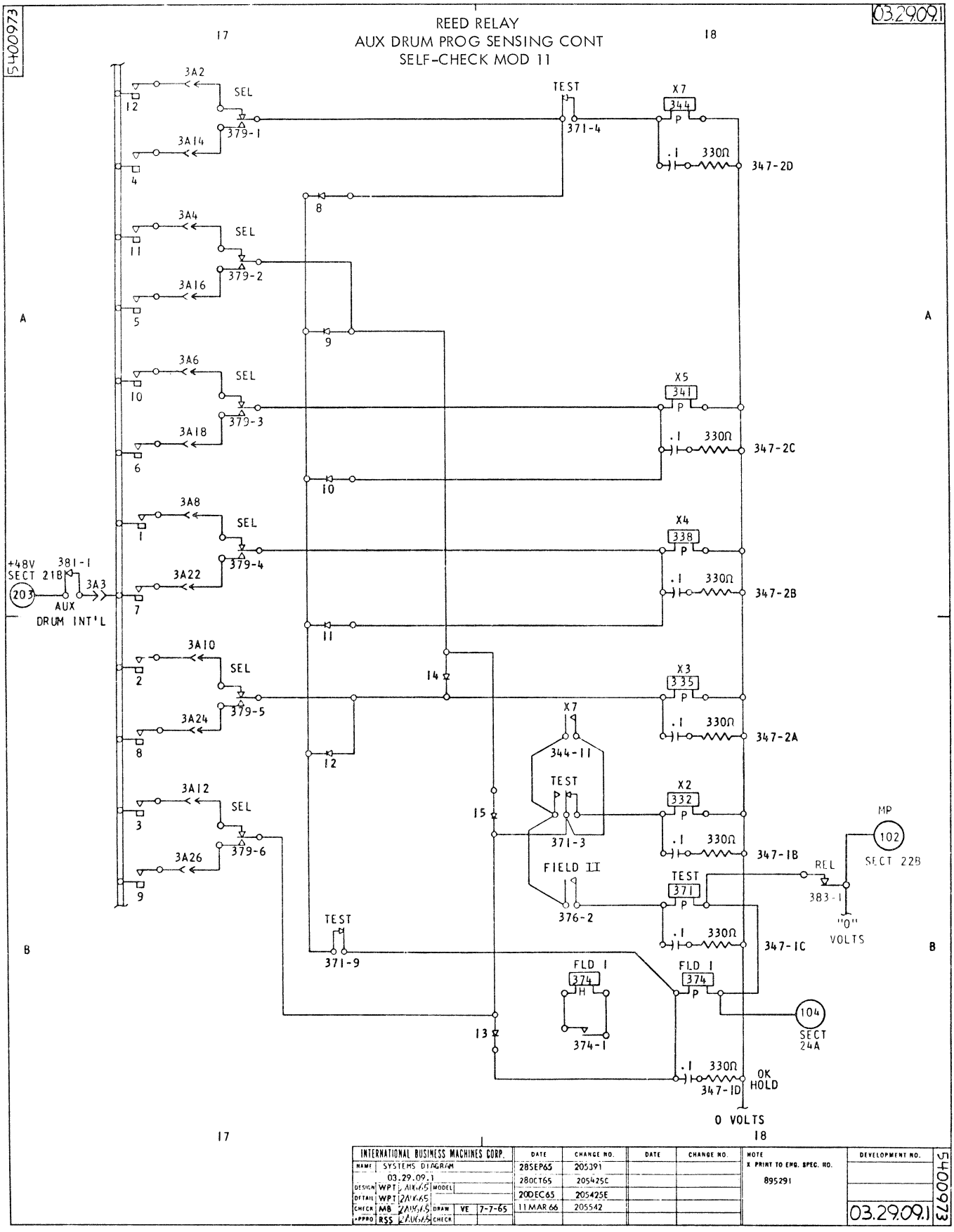
X DOTTED LINE INFORMATION IS REPEATED FROM MAIN WIRING DIAGRAM AND IS REFERENCE INFORMATION ONLY

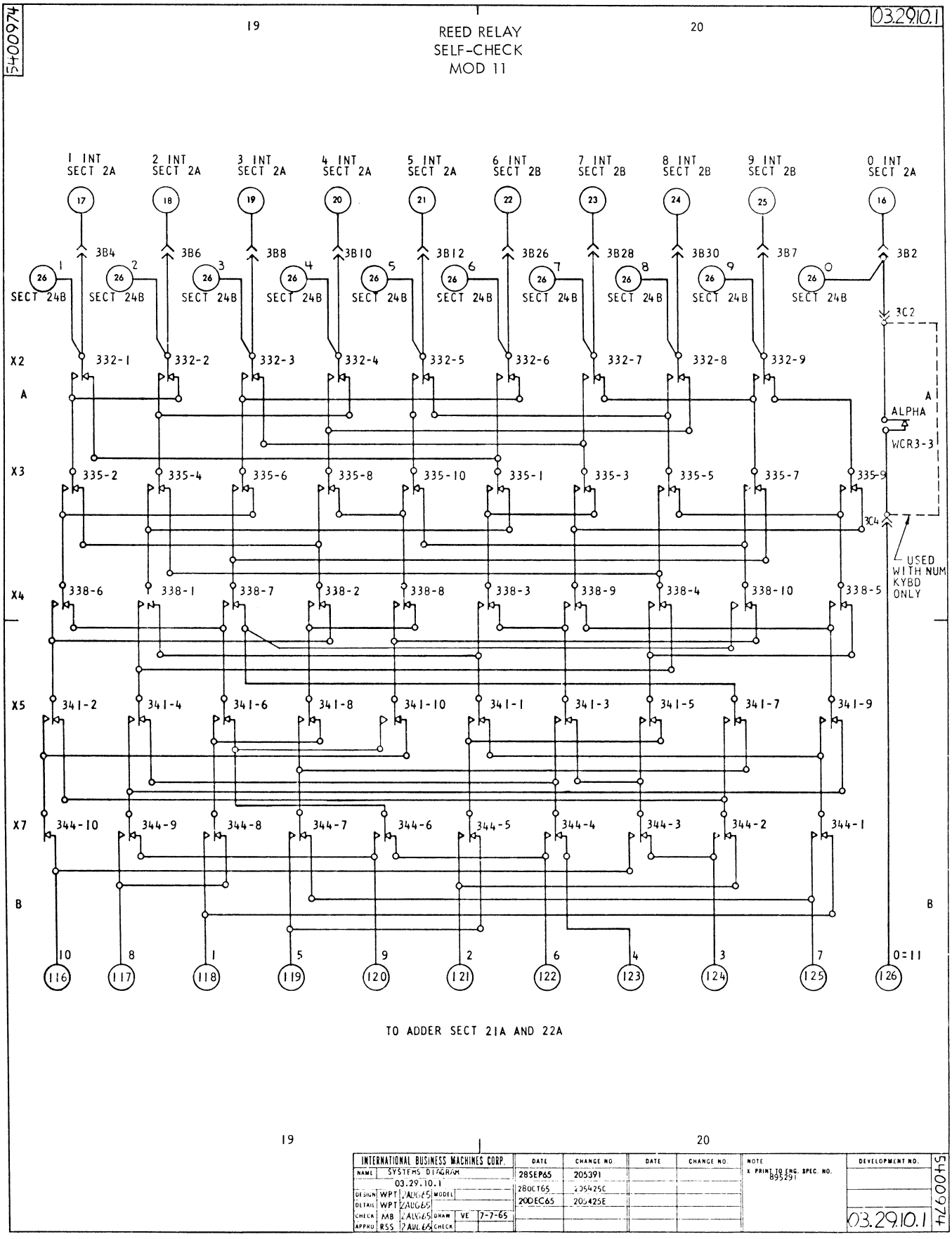
15 16

INTERNATIONAL BUSINESS MACHINES CORP.	DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME SYSTEM DIAGRAM 00.29.08.2	2 JUL 65	203[illegible]			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN WI [illegible]	10 JAN 66	203[illegible]				
DETAIL WI [illegible]	16 MAY 66	205553				
CHECK [illegible] IDT 30 MAY 66						
APPROVED [illegible]						

5373569

00.29.08.2


5400973
03.29.09.1
REED RELAY
AUX DRUM PROG SENSING CONT
SELF-CHECK MOD 11
17
18
A
B
3A2
SEL
379-1
3A14
3A4
379-2
3A16
3A6
379-3
3A18
3A8
379-4
3A22
3A10
379-5
3A24
3A12
379-6
3A26
+48V
SECT 21B
381-1
3A3
AUX
DRUM INT'L
TEST
371-4
X7
344
P
.1 330Ω
347-2D
X5
341
347-2C
X4
338
347-2B
X3
335
347-2A
X2
332
347-1B
MP
102
SECT 22B
REL
383-1
"0"
VOLTS
TEST
371
347-1C
344-11
371-3
FIELD II
376-2
371-9
FLD I
374
H
374-1
104
SECT
24A
OK
HOLD
347-1D
0 VOLTS
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.09.1
DESIGN WPT
DETAIL WPT
CHECK MB
APPRO RSS
DRAW VE 7-7-65
CHECK
DATE
CHANGE NO.
28SEP65 205391
28OCT65 205425C
20DEC65 205425E
11MAR66 205542
NOTE
X PRINT TO ENG. SPEC. NO.
895291
DEVELOPMENT NO.
03.29.09.1
5400973


5400974
19
20
03.29.10.1
REED RELAY
SELF-CHECK
MOD 11
1 INT SECT 2A
2 INT SECT 2A
3 INT SECT 2A
4 INT SECT 2A
5 INT SECT 2A
6 INT SECT 2B
7 INT SECT 2B
8 INT SECT 2B
9 INT SECT 2B
0 INT SECT 2A
17
18
19
20
21
22
23
24
25
16
3B4
3B6
3B8
3B10
3B12
3B26
3B28
3B30
3B7
3B2
SECT 24B
3C2
X2
332-1
332-2
332-3
332-4
332-5
332-6
332-7
332-8
332-9
A
ALPHA
WCR3-3
X3
335-2
335-4
335-6
335-8
335-10
335-1
335-3
335-5
335-7
335-9
3C4
USED WITH NUM KYBD ONLY
X4
338-6
338-1
338-7
338-2
338-8
338-3
338-9
338-4
338-10
338-5
X5
341-2
341-4
341-6
341-8
341-10
341-1
341-3
341-5
341-7
341-9
X7
344-10
344-9
344-8
344-7
344-6
344-5
344-4
344-3
344-2
344-1
B
10
8
1
5
9
2
6
4
3
7
0=11
116
117
118
119
120
121
122
123
124
125
126
TO ADDER SECT 21A AND 22A
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.10.1
DESIGN WPT 2AUG65 MODEL
DETAIL WPT 2AUG65
CHECK MB 2AUG65 DRAW VE 7-7-65
APPRO RSS 2AUG65 CHECK
DATE CHANGE NO.
28SEP65 205391
28OCT65 205425C
20DEC65 205425E
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5400974
03.29.10.1

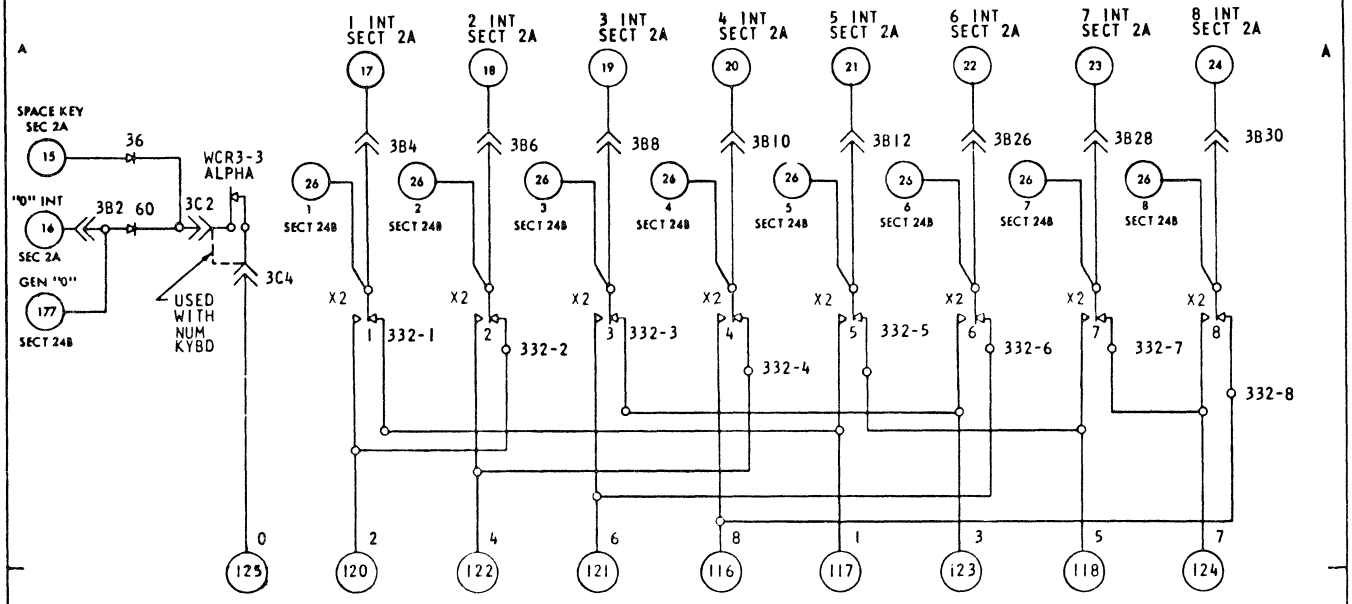
5400975

19

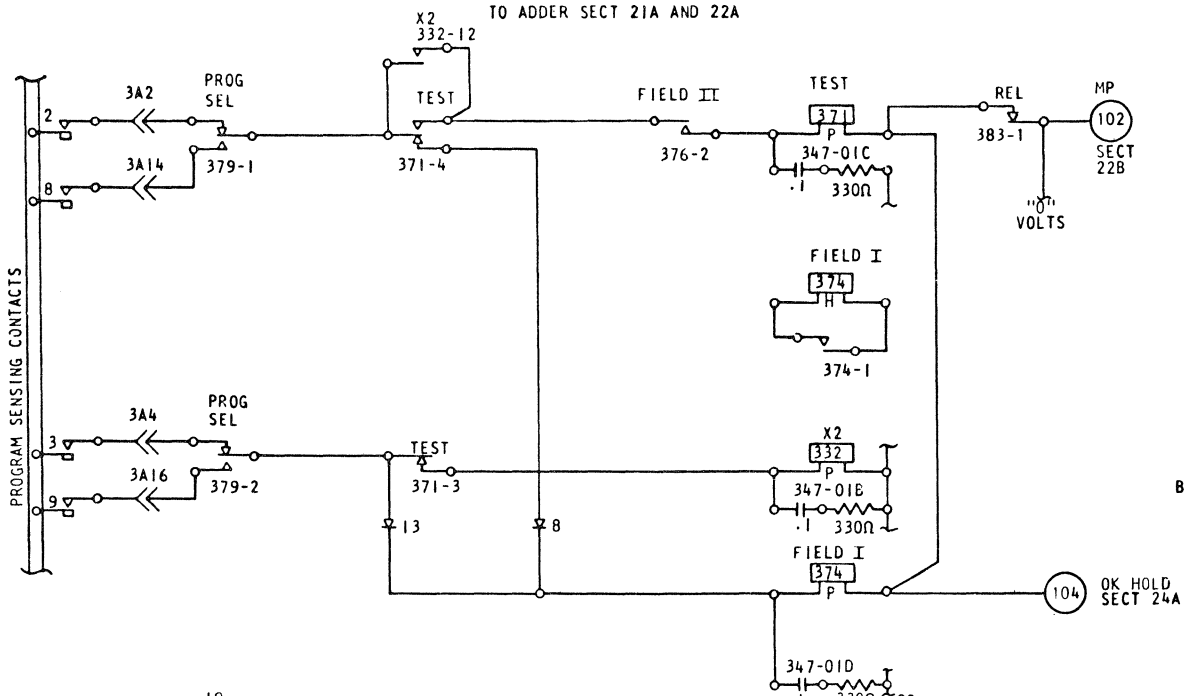
REED RELAY SELF-CHECK MOD 10

20

03.29.101



TO ADDER SECT 21A AND 22A



19

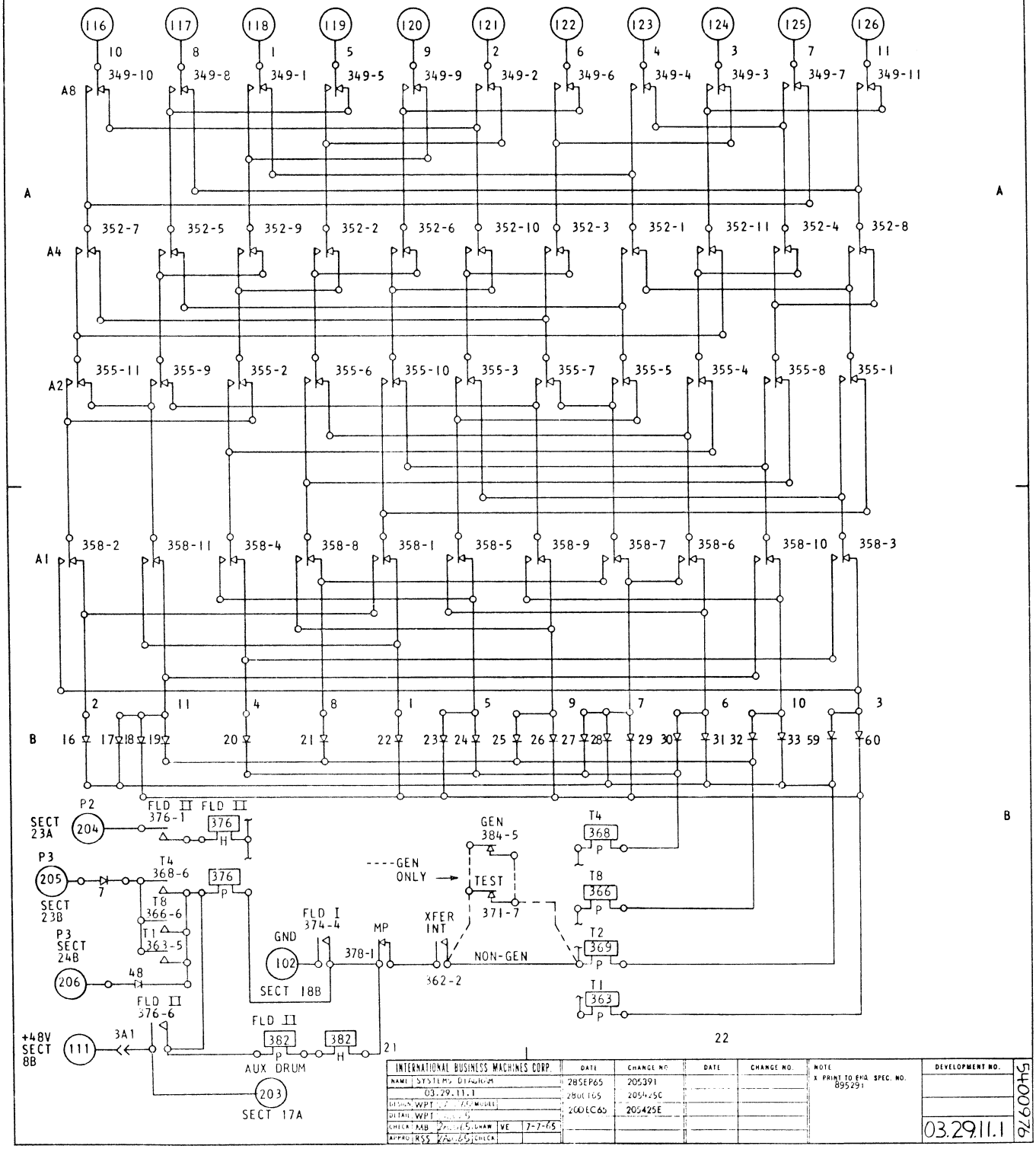
INTERNATIONAL BUSINESS MACHINES CORP.			DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM		28SEP65	205391			X PRINT TO ENG. SPEC. NO. 895291	
	03.29.10.1		28OCT65	205425C				
DESIGN	WPT 24UG65	MODEL	20DEC65	2034251				
DETAIL	WPT 24UG65							
CHECK	MB 24UG65	DRAW VE 7-7-65						03.29.10.1
APPRO	RSS 24UG65	CHECK						

5400975

21 22

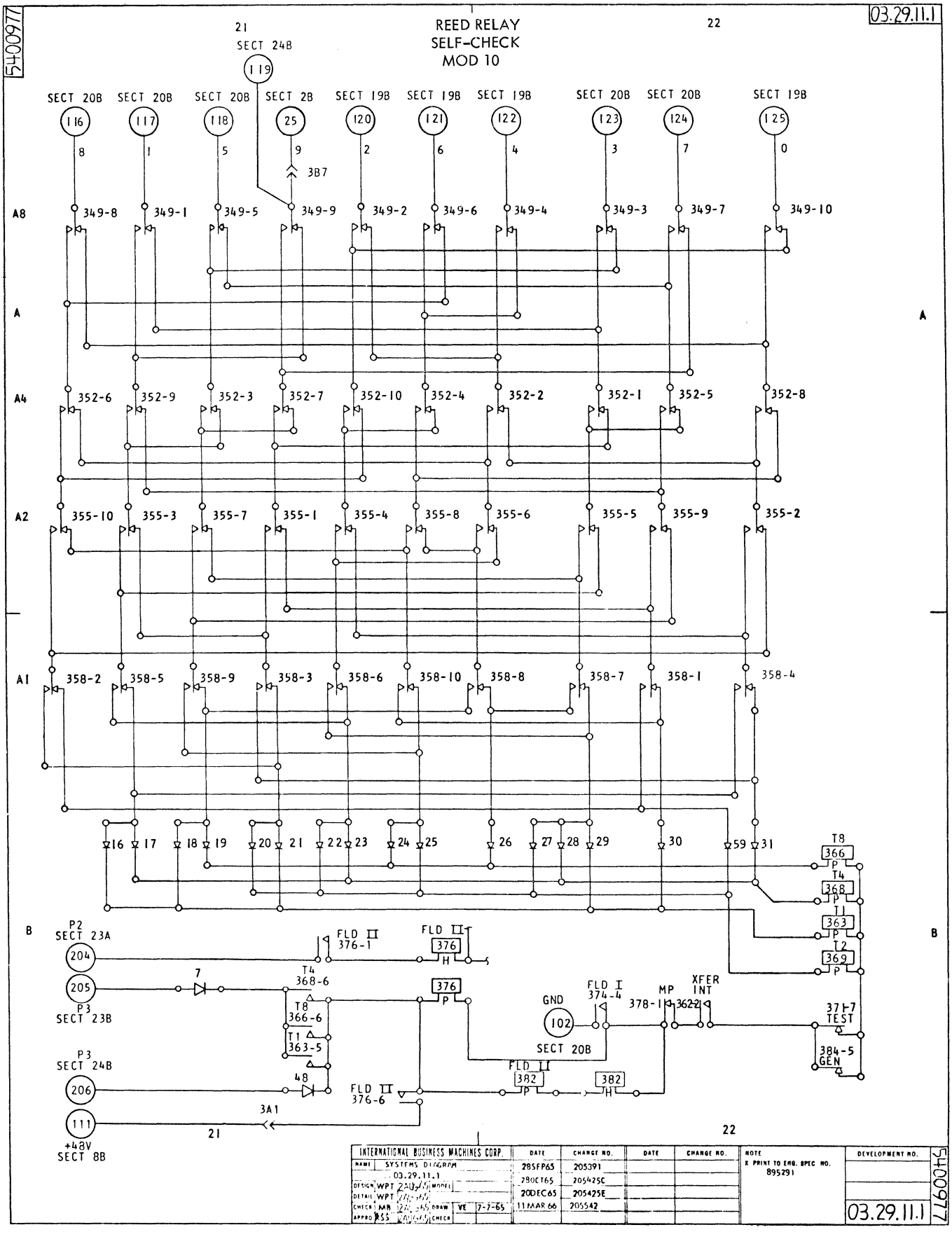
REED RELAY SELF-CHECK MOD 11

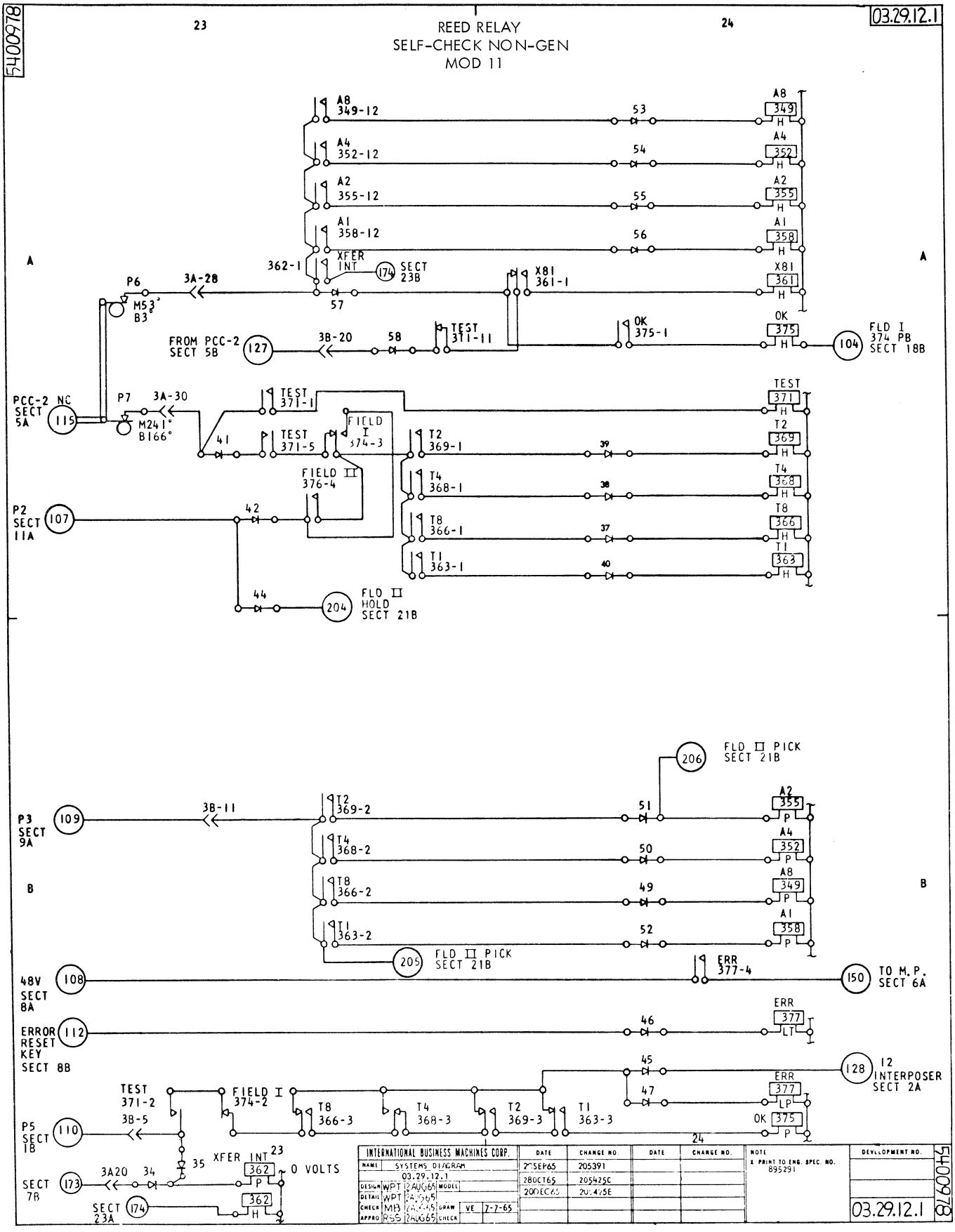
FROM MULTIPLIER SECT 19B AND 20B

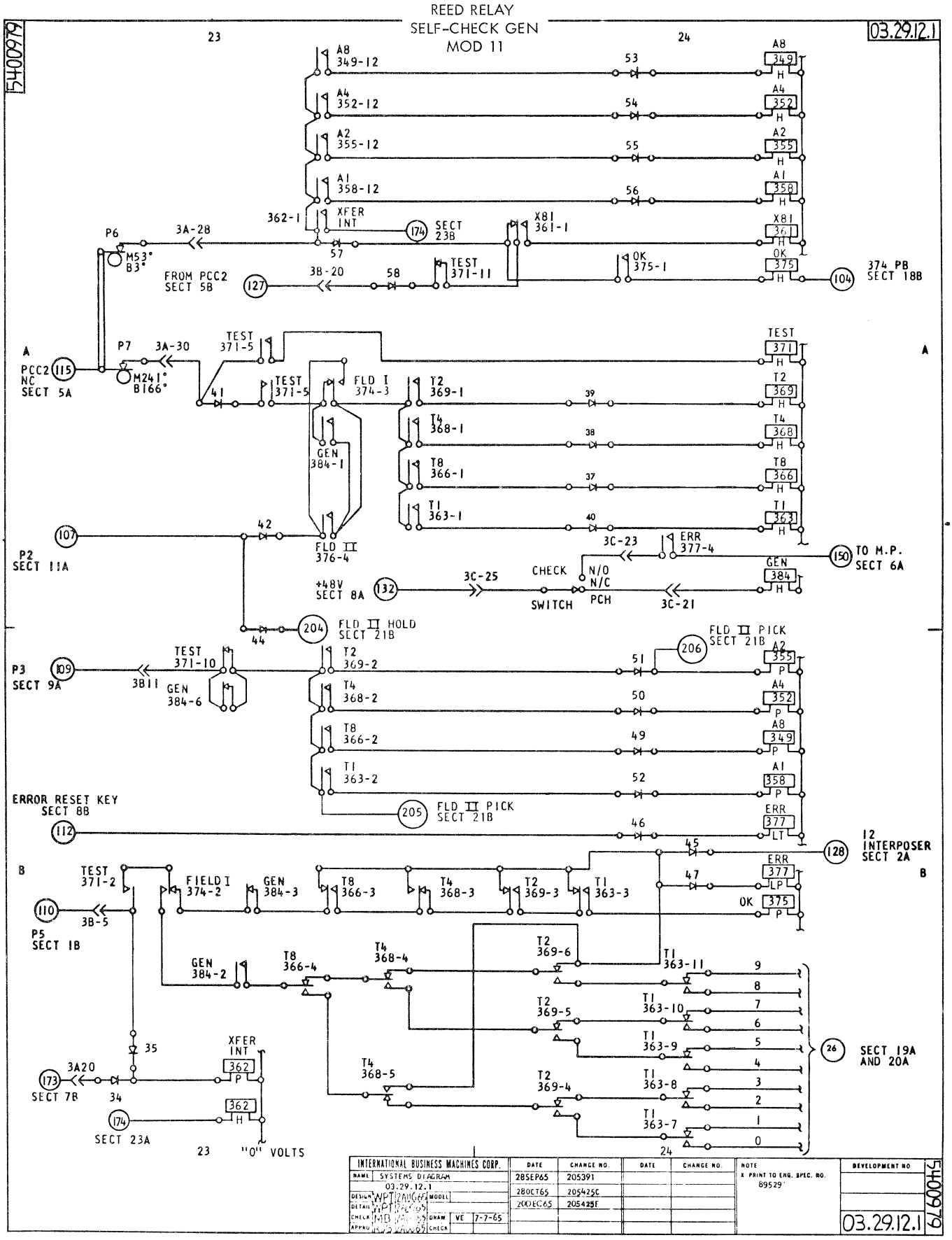


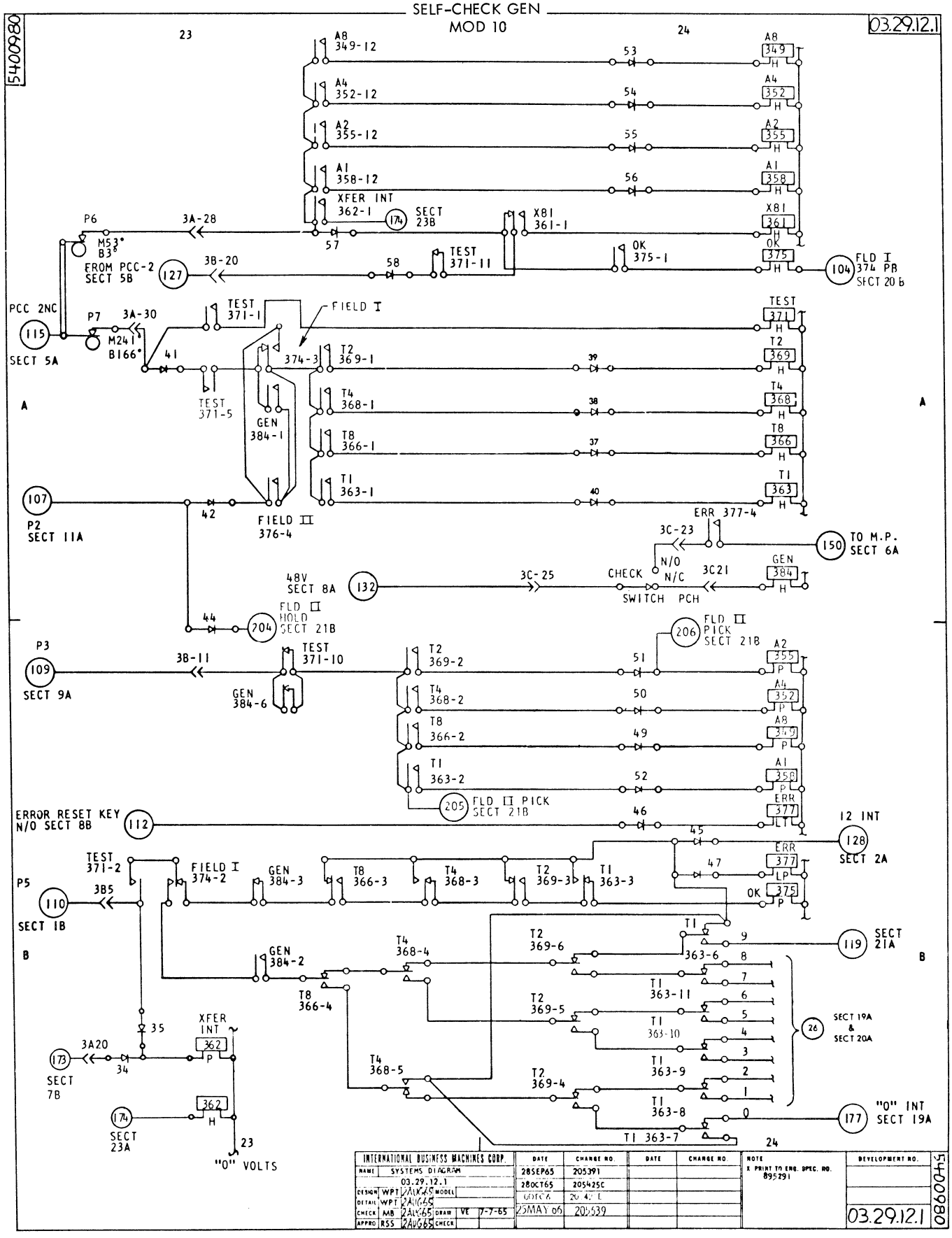
INTERNATIONAL BUSINESS MACHINES CORP.	DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME SYSTEMS DIAGRAM	28SEP65	205391			X PRINT TO END SPEC. NO. 895291	
03.29.11.1	28OCT65	205425C				
DESIGN WPT MODEL	20DEC65	205425E				
DETAIL WPT						
CHECK RAB VE 7-7-65						03.29.11.1
APPRO RSS CHECK						

540097G


5400977
03.29.11.1
REED RELAY
SELF-CHECK
MOD 10
21
22
SECT 24B
119
SECT 20B
116
SECT 20B
117
SECT 20B
118
SECT 2B
25
SECT 19B
120
SECT 19B
121
SECT 19B
122
SECT 20B
123
SECT 20B
124
SECT 19B
125
8
1
5
9
2
6
4
3
7
0
3B7
A8
349-8
349-1
349-5
349-9
349-2
349-6
349-4
349-3
349-7
349-10
A
A4
352-6
352-9
352-3
352-7
352-10
352-4
352-2
352-1
352-5
352-8
A2
355-10
355-3
355-7
355-1
355-4
355-8
355-6
355-5
355-9
355-2
A1
358-2
358-5
358-9
358-3
358-6
358-10
358-8
358-7
358-1
358-4
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 59 31
T8
366
P
T4
368
P
T1
363
P
T2
369
P
B
P2
SECT 23A
204
205
P3
SECT 23B
P3
SECT 24B
206
111
+48V
SECT 8B
FLD II
376-1
FLD II
376
H
7
T4
368-6
T8
366-6
T1
363-5
48
3A1
21
376
P
FLD II
376-6
GND
102
SECT 20B
FLD I
374-4
MP
378-1
XFER
INT
3622
FLD II
382
P
382
H
37F7
TEST
384-5
GEN
22
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.11.1
DESIGN WPT
DETAIL WPT
CHECK MR
APPRO RSS
DRAW VE 7-7-65
CHECK
DATE
CHANGE NO.
28SEP65 205391
28OCT65 205425C
20DEC65 205425E
11MAR66 205542
NOTE
X PRINT TO ENG. SPEC NO.
895291
DEVELOPMENT NO.
03.29.11.1
5400977


5400978
23
REED RELAY
SELF-CHECK NON-GEN
MOD 11
24
03.29.12.1
A8 349-12
A4 352-12
A2 355-12
A1 358-12
XFER INT
362-1
174
SECT 23B
X81 361-1
P6
3A-28
M53° B3°
57
53
54
55
56
A8 349 H
A4 352 H
A2 355 H
A1 358 H
X81 361 H
OK 375 H
OK 375-1
FROM PCC-2 SECT 5B
127
3B-20
58
TEST 371-11
FLD I 374 PB SECT 18B
104
PCC-2 NC SECT 5A
115
P7
3A-30
M241° B166°
TEST 371-1
TEST 371-5
41
FIELD I 374-3
FIELD II 376-4
T2 369-1
T4 368-1
T8 366-1
T1 363-1
39
38
37
40
TEST 371 H
T2 369 H
T4 368 H
T8 366 H
T1 363 H
P2 SECT 11A
107
42
44
204
FLD II HOLD SECT 21B
206
FLD II PICK SECT 21B
P3 SECT 9A
109
3B-11
T2 369-2
T4 368-2
T8 366-2
T1 363-2
51
50
49
52
A2 355 P
A4 352 P
A8 349 P
A1 358 P
205
FLD II PICK SECT 21B
48V SECT 8A
108
ERR 377-4
150
TO M.P. SECT 6A
ERROR RESET KEY SECT 8B
112
46
ERR 377 LT
45
47
128
12 INTERPOSER SECT 2A
ERR 377 LP
OK 375 P
TEST 371-2
FIELD I 374-2
T8 366-3
T4 368-3
T2 369-3
T1 363-3
24
P5 SECT 1B
110
3B-5
35
XFER INT 23
362 P
362 H
0 VOLTS
SECT 7B
173
3A20
34
SECT 23A
174
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.12.1
DESIGN WPT 2AUG65 MODEL
DETAIL WPT 2AUG65
CHECK MB 2AUG65 DRAW
APPRO RSS 2AUG65 CHECK
VE 7-7-65
DATE
CHANGE NO.
2SEP65 205391
28OCT65 205425C
20DEC65 205475E
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.12.1
5400978

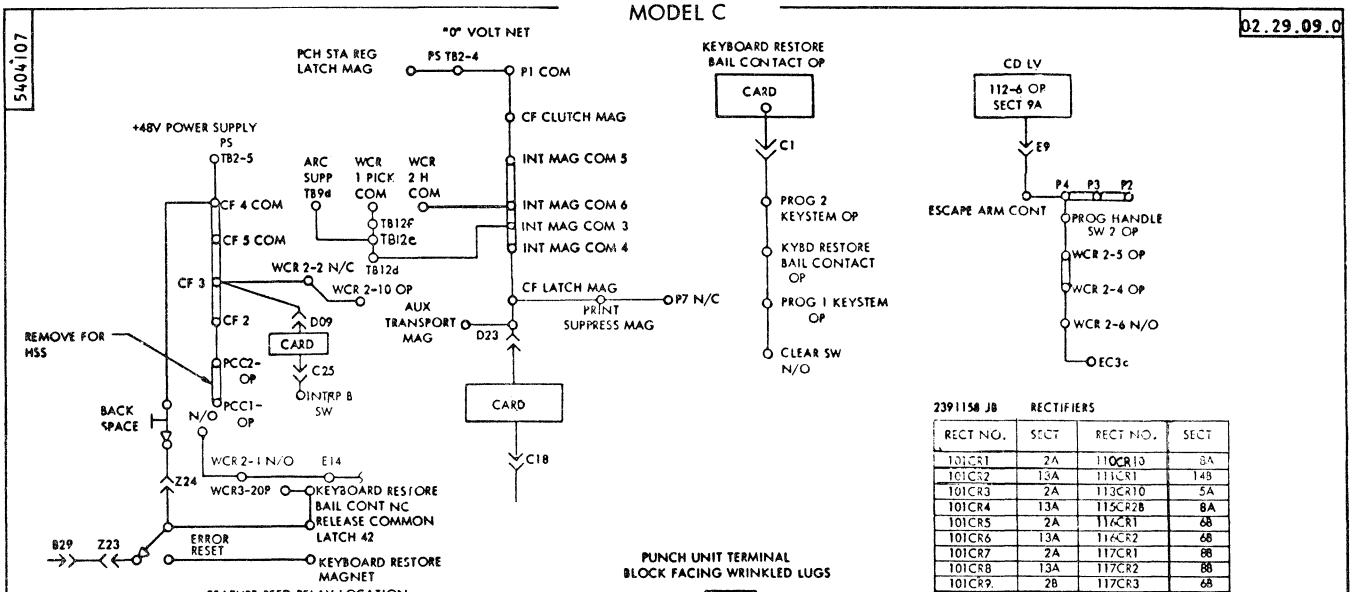

REED RELAY
SELF-CHECK GEN
MOD 11
03.29.12.1
5400979
23
24
A8 349-12
A4 352-12
A2 355-12
A1 358-12
53
54
55
56
362-1
XFER INT
174 SECT 23B
X81 361-1
P6
3A-28
M53° B3°
57
TEST 371-11
OK 375-1
FROM PCC2 SECT 5B
127
3B-20
58
374 PB SECT 18B
104
A
PCC2 NC SECT 5A
115
P7
3A-30
M241° B166°
TEST 371-5
41
FLD I 374-3
GEN 384-1
T2 369-1
T4 368-1
T8 366-1
T1 363-1
39
38
37
40
TEST 371
T2 369
T4 368
T8 366
T1 363
107
P2 SECT 11A
42
FLD II 376-4
3C-23
ERR 377-4
150
TO M.P. SECT 6A
+48V SECT 8A
132
3C-25
CHECK
N/O
N/C
SWITCH
PCH
3C-21
GEN 384
204
FLD II HOLD SECT 21B
44
206
FLD II PICK SECT 21B
P3 SECT 9A
109
3B11
TEST 371-10
GEN 384-6
T2 369-2
T4 368-2
T8 366-2
T1 363-2
51
50
49
52
A2 355 P
A4 352 P
A8 349 P
A1 358 P
205
FLD II PICK SECT 21B
ERROR RESET KEY SECT 8B
112
46
ERR 377 LT
45
128
I2 INTERPOSER SECT 2A
B
TEST 371-2
FIELD I 374-2
GEN 384-3
T8 366-3
T4 368-3
T2 369-3
T1 363-3
47
ERR 377 LP
OK 375 P
110
3B-5
P5 SECT 1B
GEN 384-2
T8 366-4
T4 368-4
T4 368-5
T2 369-6
T2 369-5
T2 369-4
T1 363-11
T1 363-10
T1 363-9
T1 363-8
T1 363-7
9
8
7
6
5
4
3
2
1
0
24
26
SECT 19A AND 20A
35
XFER INT
362 P
362 H
3A20
173
SECT 7B
34
174
SECT 23A
23
"0" VOLTS
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
03.29.12.1
DESIGN WPT12AUG65
DETAIL WPT12AUG65
CHECK MB 7-7-65
APPRO
DRAWN VE 7-7-65
CHECK
DATE 28SEP65 280CT65 20DEC65
CHANGE NO. 205391 205425C 205425F
NOTE X PRINT TO ENG. SPEC. NO. 89529
DEVELOPMENT NO.
03.29.12.1
5400979


REED RELAY
SELF-CHECK GEN
MOD 10
5400980
03.29.12.1
23
24
A8 349-12
A4 352-12
A2 355-12
A1 358-12
XFER INT 362-1
SECT 23B
X81 361-1
TEST 371-11
OK 375-1
FLD I 374 PB SECT 20B
P6
3A-28
M53* B3*
FROM PCC-2 SECT 5B
3B-20
PCC 2NC
P7
3A-30
M241* B166*
SECT 5A
TEST 371-1
FIELD I
374-3
T2 369-1
T4 368-1
T8 366-1
T1 363-1
TEST 371-5
GEN 384-1
FIELD II 376-4
P2 SECT 11A
ERR 377-4
3C-23
TO M.P. SECT 6A
48V SECT 8A
3C-25
CHECK SWITCH
N/O N/C
3C21
PCH
GEN 384
FLD II HOLD SECT 21B
FLD II PICK SECT 21B
P3
3B-11
SECT 9A
TEST 371-10
GEN 384-6
T2 369-2
T4 368-2
T8 366-2
T1 363-2
A2 355 P
A4 352 P
A8 349 P
A1 358 P
FLD II PICK SECT 21B
ERROR RESET KEY N/O SECT 8B
ERR 377 LT
12 INT
SECT 2A
ERR 377 LP
OK 375 P
TEST 371-2
FIELD I 374-2
GEN 384-3
T8 366-3
T4 368-3
T2 369-3
T1 363-3
P5
3B5
SECT 1B
GEN 384-2
T4 368-4
T8 366-4
T4 368-5
T2 369-6
T2 369-5
T2 369-4
T1 363-6
T1 363-11
T1 363-10
T1 363-9
T1 363-8
T1 363-7
SECT 19A & SECT 20A
SECT 21A
"0" INT SECT 19A
XFER INT 362 P
362 H
3A20
SECT 7B
SECT 23A
"0" VOLTS
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
03.29.12.1
DESIGN WPT 12AUG65
DETAIL WPT 12AUG65
CHECK MB 12AUG65
APPRO RSS 12AUG65
DRAW VE 7-7-65
CHECK
DATE CHANGE NO.
28SEP65 205391
28OCT65 205425C
25MAY66 205539
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
03.29.12.1
5400980

REED RELAY LOCATION CHART MODEL C

5404107

02.29.09.0

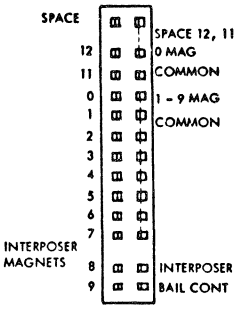


FEATURE REED RELAY LOCATION

RELAY	NO.	COIL	1	2	3	4	5	6	PART NO.
MCT	119	6A	6A	7B	7B	5A	5B	7A	766076
AUX. DUP	130	2B	2B	1B		2B			766073
HSS-1 AND 2	NOTE XIII								
CD LEVER	125	8B	9B						766086
PROGRAM SELECT	106	8A	9A	9A	11B	11B			766073
CLEAR 1	107	6B	6B	6A	5A	6B	5A	6B	766076
CLEAR 2	108	6B	5B	5A	6B	6B			766073
CARD LEVER	110	8B	9B		8A	5A			766073
* PRINT	111	14A	14A	14B		14B			766073
CARD LEVER	112	8B	8B		9B	5A	1A	9A	766076
MULTI PUNCH	113	6A	5A	10B	9B	9A	10B	11A	766075
DUP 1	114	10A	7B	9B	10B	10A			766073
PROG SELECT	115	8A	8A	9B	9B	9A	9A		766076**
DUP 1	116	10A	10A	11A	12B	10A			766071
SKIP	117	10B	7B						766086**
DUP 2	120	10A	1B		10A	10A			766073
RELEASE	121	6B	10B	6B	5A		7B	9B	766076**
DUP 2	122	10A	9B	11A	6A	10A			766073**
SKIP	123	10B	9B	13B	9B	10A	12A	9B	766075
ESCAPE INTERLOCK	131	12A	12A	11A		10A	10A	10B	766075
X-R ELIMINATE	126	10A	2A	2A					766080

**RACE RELAYS ARE MANDATORY IN THESE POSITIONS

PUNCH UNIT TERMINAL BLOCK FACING WRINKLED LUGS



2391158 JB RECTIFIERS

RECT NO.	SECT	RECT NO.	SECT
101CR1	2A	110CR10	8A
101CR2	13A	111CR1	14B
101CR3	2A	113CR10	5A
101CR4	13A	115CR2B	8A
101CR5	2A	116CR1	6B
101CR6	13A	116CR2	6B
101CR7	2A	117CR1	8B
101CR8	13A	117CR2	8B
101CR9	2B	117CR3	6B
101CR10A	8A	117CR5	6B
101CR10B	13A	120CR1	6B
102CR1	2A	120CR10	13A
102CR2	13A	122CR1	10B
102CR3	2B	124CR10B	11A
102CR4	13A		
102CR5	2B	124CR10B	10A
102CR6	13A	124CR3	7B
102CR7	2B	124CR4	9B
102CR8	13A	124CR8	9A
102CR9	2B	124CR9	10B
103CR3	2A	124CR10	6B
103CR5B	1B		
103CR7	2A	128CR8	5A
105CR1	8B		
105CR5	8A	129CR4	10A
106CR1	6A	130CR10B	10A
106CR10	8A	132CR1	7B
107CR10	5B	132CR5	6B
		132CR9	10B
111CR10	14A	134CR10	10B
119CR10	14B	138CR1	9B

RESISTOR AND CAPACITOR LOCATION

PART NO.	RES CAP NO.	SECT
597682	115R10	8A
317428	128R1	1B
301149	128R2	1B
217077	128C4	1B
317014	134R4	10B
482145	134C1	10B
559288	R1 115Ω 20W	12A
5347750		

CONNECTOR CHART

PIN	A	B	C	D	E	F	Z
1		14B	1A		9B**		2A
2	6A	2A	1B		9A		1A
3	7B	11A	6A**		12A		11A
4	2A	2B	14B	8A	10B**		1A
5		1B	5A	9B	10A		1A
6	2A		2A	7A			1A
7	6A	10A	6B	8A	9B**		1A
3	2A	2B		6A	6A		1A
9	5A	10A	2B**	8A	11A		1A
10	2A	2B	1A	9A	5A		1B
11	7B	2B**	1B	9B	9A		1B
12	2B	2A	5A	9A	5B		2A
13	6A**	2B	5A	9B	10A		1B
14	2B	2B	3B	11B			6A
15	9B	9B	5A	9A	2A		6A
16	2A	2B	3B	11B	5B		11A
17	1B	9A	9A	9A	2A		7A
18	2A	2A	*		11B		8B
19		9B	1A		10A		1B
20	2A	5B	10A		5B		11A
21	8B	6B	10B	9B	10B		13B
22	2A	2A	8A		10A		9B
23	5A	9B	8B	*	5B		*
24	9B	2A	5A	10B	8B		*
25	7A**	1B	8A	6A	2A		3B
26	2B		7A**	8A	6B		5B
27	7A**	9B	9A	7A**	2A		3B
28	2B	2A	3A	9A	11A		2B**
29	8A	5A	10B	12A			
30	2B		7A	12B			

*LOCATION IS SHOWN ON REFERENCE PAGE ** NOTE XII

PART NO.	COIL R OHMS	1	2	3	4	5	6
766071	3460	N/O	N/O	N/O	N/O		
766073	3460	N/O	N/C	N/C	N/O		
766075	1940	N/O	N/C	N/C	N/C	N/C	N/O
766076	1940	N/O	N/O	N/C	N/C	N/O	N/O
766086	7385	N/O					
766090	5735	N/C	N/C				

RACE RELAY #	SUB RELAY #
766071	765700
766073	765722
766075	765725
766076	765726
766086	765825
766080	765816

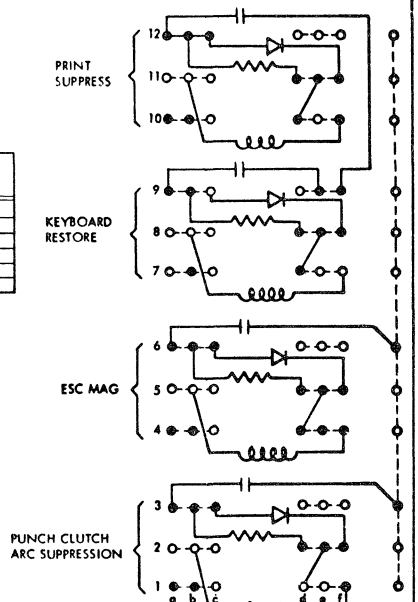
CARD FEED (CF) CAMS

NO.	LOC	PART NO.	M	B
1				
2	5B	309630	355° ± 2	180° ± 5
3	7B	309631	70° ± 2	150° ± 5
4	7B	309631	16° ± 2	96° ± 5
5	12A	311384	30° ± 2	45° ± 5

WCR 2 POS	LOC
1	2B
2	5B
3	5B
4	8B
5	9B
6	10A
7	10A
8	14B
9	11A
10	12A
11	5B
12	12A
P	11A
H	11A

PUNCH (P) CAMS

NO.	LOC	PART NO.	M	B
1	12A	309630	210° ± 1	30° ± 3
2	11A	309634	149° ± 3	79° ± 2
3	9A	227694	100° ± 1	60° ± 3
4	10A	309630	175° ± 3	355° ± 2
5	1B	309629	86° ± 3	166° ± 2
6	12A	309630	355° ± 3	175° ± 2
7	12A	313414	262° ± 3	60° ± 2



ARC SUPP ASSEMBLIES (NOTE XI)

MAG	ARC SUPP PART NO.	LOC
DIODE ASM	5400887	
KYBD REST BAIL CONT	5372368	1A
INDUCTOR ASM	5400916	
CAPACITOR	5400889	
CD FD CLUTCH MAG	2160917	6A
RESISTOR ASM	5400888	
ESC INT RLY	347820	12A
CAPACITOR ASM (SHORT LEAD)	5400890	
CAPACITOR ASM	315962	
RESISTOR ASM	1129186	

WIRE CONTACT RELAYS

RELAY	NO.	COIL	1	2	3	4	PART NO.
ESC INTLK	1	12A	10B			12A	328273
ALPHA	3	12B	12B	9B		1A	196208

ALPHA RELAY LOCATED INSIDE KEYBOARD

NOTES

XI ARC SUPPRESSION ASSEMBLIES WITHOUT LOC ARE LOCATED ON ARC SUPPRESSION TB.

XII THESE POINTS DO NOT APPEAR ON STANDARD PAGES. THEY APPEAR ONLY ON FEATURE PAGES.

XIII HSS RELAY POINTS ARE ALL LOCATED ON HSS LOGIC PAGE.

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE X PRINT TO ENG. SPEC. NO. 895291	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					7-13-65	205333				
	02.29.09.0					28OCT65	205425C				
DESIGN	WT	52665	MODEL			11MAR66	205542				
DETAIL						11APR66	205632				02.29.09.0
CHECK	LF	52665	DRAW	VE	5-4-63						
APPRD	RLJ	52665	CHECK								

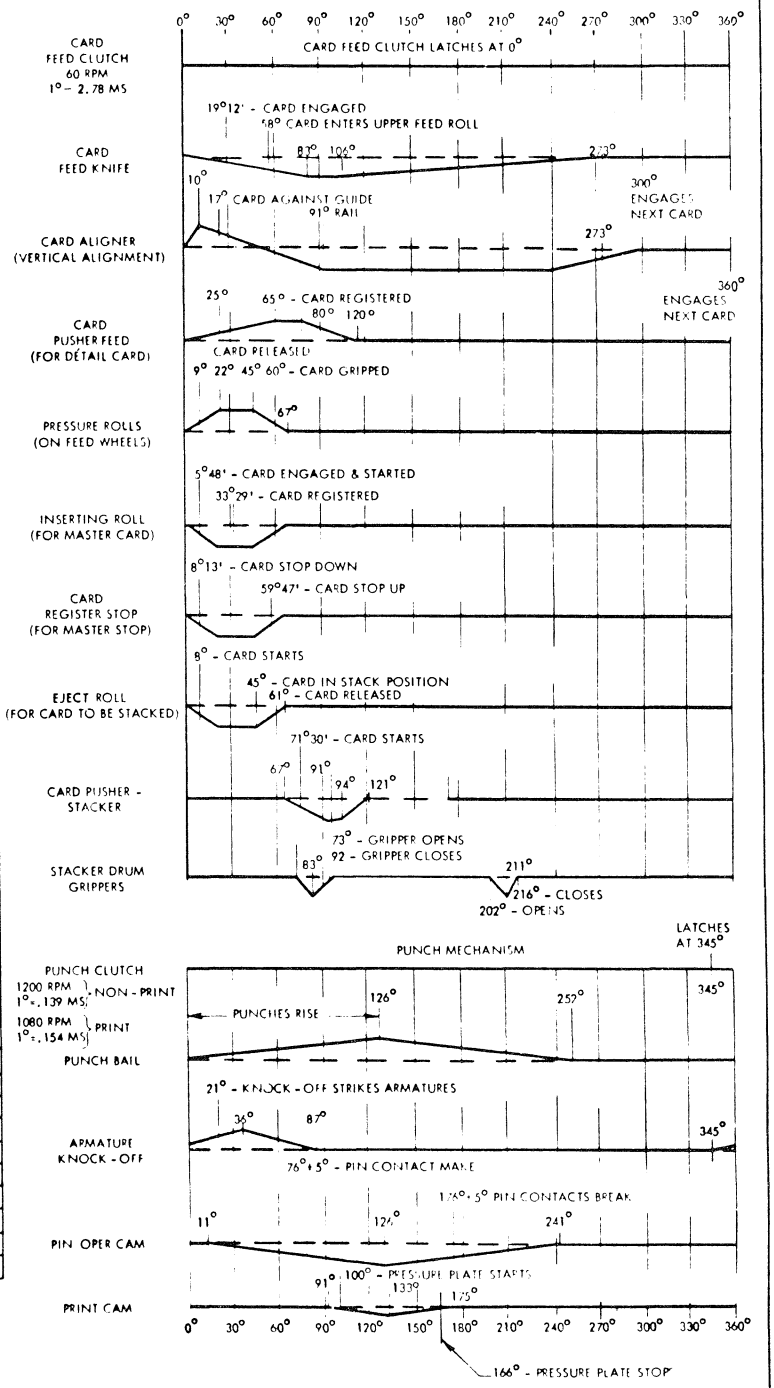
5404107

REED RELAY
KEYBOARD VLCD & CAM REFERENCE
MODEL C

STEM POS	GRAPHIC ALPHA	GRAPHIC NUMERIC	CARD CODE ALPHA	CARD CODE NUMERIC	BAILS ALPHA	BAILS NUMERIC	LATCHES ALPHA	LATCHES NUMERIC
1	ERROR RESET							
2	MULTI PUNCH							
3	NUMERIC							
4	Q	+	11-8	12-8-6	13-9	12-8-6		
5	A		12-1		15-3			
6	@	'	8-4	8-3	9-7	8-2		
7	Z		0-9		1-11			
8	W	-	0-6	0-8-5	14	14-8-4	X	
9	S	>	0-2	0-8-6	14	14-8-6	X	
10	%	,	0-8-4	0-8-3	14-9-7	14-8-2		
11	X	?	0-7	0-8-7	14	14-8	X	X
12	E	)	12-5	11-8-5	15	10-8	X	X
13	D	:	12-4	8-2	15-7	8		X
14	*	$	11-8-4	11-8-3	7-9	8-2	X	X
15	C	"	12-3	8-7	15-5	8		X
16	R	¢	11-9	12-8-2	13-11	12-8		X
17	F	;	12-6	11-8-6	15	10-8	X	X
18	<	.	12-8-4	12-8-3	9-7	8-2	X	X
19	V		0-5	6-8	1	8-6	X	
20	T	0-8-2	0-3	0-8-2	14-5	14-8		X
21	G	—	12-7	11-8-7	15	10-8	X	X
22	MASTER CARD						X	X
23	B	!	12-2	11-8-2	15	10-8	X	X
24	Y	]	0-8	12-8-7	1-9	12-8		X
25	H	'	12-8	8-5	15-9	8-4		
26	DUP							
27	N	[	11-5	12-8-5	13	12-8	X	X
28	U	1	0-4	1	1-7			X
29	J	4	11-1	4	13-3			X
30	-	-	11	11	13	10		
31	M	7	11-4	7	13-7			X
32	I	2	12-9	2	15-11			X
33	K	5	11-2	5	13	4	X	
34	/	0	0-1	0	14-3	14		
35	,	8	0-8-3	8	1-9-5	8		
36	0	3	11-6	3	13	2	X	
37	L	6	11-3	6	13-5	6		
38	SPACE						X	X
39	.	9	12-8-3	9	15-9-5			X
40	P	&	11-7	12	13	12	X	
41	SKIP						X	X
42	RELEASE						X	X
43	AUX DUP						X	X
44	FEED							
45	REGISTER						X	X
46	PROG 2							
47	ALPHA							
48	LEFT ZERO						X	X
49	LEFT ZERO							
50	PROG 1							

ODD NUMBER BAILS ON RIGHT SIDE OF KEYBOARD
EVEN NUMBER BAILS ON LEFT SIDE OF KEYBOARD

MECHANICAL TIME CHART
CARD FEED MECHANISM



INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			7-13-65	205333			X PRINT TO ENG. SPEC. NO. 895291	
	02,29,10,0			25 MAY 66	205639				
DESIGN	WT	5-26-65	MODEL						
DETAIL									
CHECK	LF	5-26-65	DRAW	GT	4-19-65				02.29.10.0
APPRO	RLJ	5-26-65	CHECK	DJH	4-20-65				

5404109

REED RELAY LOCATION CHART
SELF-CHECK MOD 11

5400981

03.29.13.0

RECTIFIERS (2391158) NOTE XV

DIODE NO.	SECT NO.	DIODE NO.	SECT NO.
101CR1	2A	113CR10	5A
101CR2	13A	115CR2B	8B
101CR3	2A	116CR1	6B
101CR4	13A	116CR2	6B
101CR5	2A	117CR1	8B
101CR6	13A	117CR3	6B
101CR7	2A	117CR5	6B
101CR8	13A	119CR10	5A
101CR9	2B	120CR1	6B
101CR10A	8A	120CR10	13A
101CR10B	13A	122CR1	10B
102CR1	2A	122CR2	11A
102CR2	13A		
102CR3	2B	123CR10B	10A
102CR4	13A	124CR3	7B
102CR5	2B	124CR4	9B
102CR6	13A	124CR8	9A
102CR7	2B	124CR9	10B
102CR8	13A		
102CR9	2B	128CR10	14B
103CR3	2A	129CR4	10A
103CR7	2A	130CR10B	10A
105CR1	7B	132CR1	7B
105CR5	8A	132CR5	6B
106CR1	6A	132CR8	10B
106CR10	8A	133CR1	5B
107CR10	5B	134CR10	10B
110CR2	14A	117CR2	8B
110CR10	8A		
111CR1	14A		

DIODE LOCATION (GATE 03)

DIODE	SECT	DIODE	SECT
1	8B	31	22B
2	9B	32	22B
3	8A	33	22B
4	10B	34	23B
5	8A	35	23B
6	6A	36	12A
7	21B	37	24A
8	17A	38	24A
9	17A	39	24A
10	17A	40	24A
11	17B	41	23A
12	17B	42	23A
13	18B	43	12B
14	17B	44	23A
15	18B	45	24B
16	21B	46	24B
17	21B	47	24B
18	21B	48	21B
19	21B	49	24B
20	21B	50	24B
21	21B	51	24B
22	21B	52	24B
23	21B	53	24A
24	21B	54	24A
25	22B	55	24A
26	22B	56	24A
27	22B	57	23A
28	22B	58	23A
29	22B	59	22B
30	22B	60	22B

WIRE CONTACT RELAY LOCATION (GATE 03)

RELAY	NO	P	H	1	2	3	4	5	6	7	8	9	10	11	12	P/N
X-2	332	18B		19A	19A	19A	19A	19A	20A	20A	20A	20A				196186
X-3	335	18B		20A	19A	20A	19A	20A	19A	20A	19A	20A	19A			196186
X-4	338	18A		19A	19A	20A	20A	20A	19A	19A	19A	20A	20A			196186
X-5	341	18A		20B	19B	20B	19B	20B	19B	20B	19B	20B	19B			196186
X-7	344	18A		20B	20B	20B	20B	20B	19B	19B	19B	19B	19B	18B		196186
ESC INT	1	12A		10B		9B	12A	LOCATION (CARD TRANSPORT)								104753
XFER INT	362	23B	23B	23A	21B											196208
A8	349	24B	24A	21A	21A	22A	22A	21A	22A	22A	21A	21A	21A	22A	23A	255735
A4	357	24B	24A	22A	21A	22A	22A	21A	21A	21A	22A	21A	21A	22A	23A	255735
A2	359	24B	24A	22A	21A	21A	22A	22A	21A	22A	22A	21A	21A	21A	23A	255735
A1	358	24B	24A	21B	21B	22B	21B	21B	22B	22B	21B	22B	22B	21B	23A	255735
X-81	361	10B	24A	24A												196208
T-1	363	22B	24A	23A	23B	24B		21B		24B	24B	24B	24B	24B		255735
T-8	366	22B	24A	23A	23B	23B	23B		21B							196198
T-4	368	22B	24A	23A	23B	23B	23B	23B	21B							196198
T-2	369	22B	24A	23A	23B	24B	24B	24B	24B							196198
TEST	371	18B	24A	23A	23B	18B	18A	23A	7A	22B	10A	17A	23B	23A		255735
FIELD-I	374	17B	18B	18B	23B	23A	21B									196208
OK	375	24B	24A	24A	10B	10B										196208
FIELD-II	376	21B	21B	21B	18B	1A	23A	10A	21B							196198
ERROR	377	24B	24B	9A	7A	7A	24A	9B	10B							186686
MULTI-PCH	378		6A	21B	10B											196208
SC-PRO-SEL	379		8B	17A	17A	17A	17A	17B	17B							196198
AUX DRUM INTLK	381	12B	12B	17A												196208
SC-REL	383		6B	18B	10A	6B	6B									196208
GEN	384		24A	24A	23B	23B	7A	21B	23B							196198
ALPHA	3	12B	12B		9B	19A	1A	LOCATION (KEYBOARD)								196208
FLD II	382	22B	22B		1A											196208

ARC SUPP P/N 328602

	A	B	C	D	
347-1		18B	18B	18B	
347-2	18A	18A	18A	18A	

CONNECTOR CHART

PIN	01A	01B	01C	01D	01E	01F	Z	03A	03B	03C
1		14B	1A				2A	21B	11B	1A
2	6A	2A			9A		1A	17A	20A	20A
3	7B	11A	**6A		12A		*	17A	11A	2A
4	2A	2B	14B	8A			1A	17A	19A	20A
5		1B	5A	9B	9A		1A	7B	23B	10A
6	2A		2A	7B			1A	17A	19A	2A
7	6A		6B	8A			1A		20A	9A
8	2A	2B	12B	6A	6A		1A	17A	19A	1B
9	5A		2B**		11A		1A		12B	6B
10	2A	2B	1A	9A	5A		1B	17B	19A	1B
11	7B	2B**	1B	9B	9A		1B		23B	8B
12	2B	2A	5A	9A	5B		2A	17B	19A	
13	**6A	2B	5A	9B	10A		1B			8B
14	2B	2B	3B	11B			6A	17A	8B	
15	9B	9B	5A	9A			6A		9B	6A
16	2A	2B	3B	11B	5B		8B	17A	9B	
17	1B	9A	9A	9A			7B		9A	12B
18	2A	2A	*		11B		8B	17A	9A	
19		9B	2A	8B			1B		9B	1A
20	2A	5B	10A		5B		11B		23A	
21	8B		10B	9B	10B		14B		2A	24A
22	2A	2A	8A	8B			9B	17A		
23	5A	11A	8B		5B		*	6B		24A
24	9B	2A	6A	10B			*	17B		
25	**7B	1B	8A	6A			4B		9B	24A
26	2B		**8B	8A	8B		5B	17B	20A	
27	7B**	9B	9A				4B			8A
28	2B	2A	5A	9A	11A		2B**	23A	20A	
29	8A	5A	10B	12A						12B
30	2B	7A						23A	20A	

*LOCATION SHOWN ON REFERENCE PAGE
**NOTE XVIII

REED RELAY LOCATION

RELAY	NO	COIL		1	2	3	4	5	6	PART NUMBER
PROG SELECT	106	8A		9A	9A	11B	11B			766073
CLEAR I	107	6B		6B	6A	5A	5B	5A	5B	NOTE XIII
CLEAR II	108	6B		5B	5A	6B			6B	766075
CARD LEVER	110	8B		9B		8A	5A			766073
PRINT	111	14A		14A	14B		14B			766073
CARD LEVER	112	8B		8B		9B	5A	1A	9A	766076
MULTI-PCH	113	6A		5A	10B	9B	9A	10B	11A	766075
PROG-SELECT	115	8A		8A	9B	9B	9A	9A	8B	766076
DUP I	116	10A		10A	10A	11A	11B	10A		766071
SKIP	117	10A		7A						NOTE XIV
DUP II	120	10A		1B		10A	10A			766073
RELEASE	121	6B		10B	6B	5A		7B	9B	NOTE XIII
DUP II	122	10A		9B	11A	6A	10A			NOTE XII
SKIP	123	10B		10B	13B	9B	10A	12A	9B	766075
ESCAPE INT'L	131	12A		12A	11A		10A	10A	10B	766075
DUP I	114	10A		7B	9B	10B	10A			NOTE XII

RESISTOR & CAPACITOR LOCATION

PART NO.	RES CAP#	SECT
597682	115R10	8A
317428	128R1	1B
301149	128R4	1B
217077	128C4	1B
317014	134R4	10B
482145	134C1	10B
5404302	470Ω	7A

RACE RELAY#	SUB RELAY#
766071	765700
766073	765722
766075	765725
766076	765726
766086	765825

PUNCH (P) CAMS

NO	LOC	PART NO	M	B
1	12A	309630	180°±1°	0°±3°
2	11A	309634	149°±3°	79°±2°
3	9A	227694	10°±1°	60°±3°
4	10A	309630	175°±3°	355°±2°
5	1B	309629	86°±3°	166°±2°
6	23A	310255	53°±3°	3°±2°
7	23A	309631	241°±3°	166°±2°

CARD FEED (CF) CAMS

NOTE XVI

NO	SECT	PART NO	M	B
1				
2	5B	309630	355°±2°	180°±5°
3	7B	309631	70°±2°	150°±5°
4	7B	309631	5°±2°	85°±5°
6	11B	313807	340°±5°	75°±2°

FEATURE REED RELAY LOCATION

RELAY	NO	COIL	1	2	3	4	5	6	PART NO.
MC1	119	6A	6A	7B	7B	5A	5A	7B	766076
HSS1 - 2	NOTE XVII								

ARC SUPP ASSEMBLIES (NOTE XI)

MAGNET	ARC SUPP PART NO	LOC
DIODE ASM	5400887	
KYBD REST CAIL C'T	5372368	1A
INDUCTOR ASM	5400916	
CAPACITOR	5400889	
CD FD CLUTCH MAG	2160917	6A
RESISTOR ASM	5400888	
ESC INT RELY	347820	12A
CAP ASM (SHORT LD)	5400890	
CAPACITOR ASM	310962	
RESISTOR ASM	1127186	

NOTES
- XI ARC SUPP ASSEMBLIES WITHOUT LOC ARE LOCATED ON ARC SUPPRESSION TB
- XII PART NUMBER 766073 MUST BE USED
- XIII PART NUMBER 766076 MUST BE USED
- XIV PART NUMBER 766086 MUST BE USED
- XV PART NUMBER 2111232 MAY BE SUBSTITUTED
- XVI SUBSTITUTE RELAYS LISTED IN CHART ARE NOT TO BE USED AS PER NOTES XII, XIII AND XIV
- XVII HSS RELAY POINT ARE ALL LOCATED ON HSS LOGIC PAGE
- XVIII THESE POINTS DO NOT APPEAR ON STANDARD PAGES THEY APPEAR ONLY ON FEATURE PAGES

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					28SEP65	205391			X PRINT TO ENG. SPEC. NO. 895291	
	03.29.13.0					28OCT65	205425C				
DESIGN	WPT	2AUG65	MODEL			20DEC65	205425E				
DETAIL						11MAR66	205542				
CHECK	MB	2AUG65	DRAW	VE	4AUG65	11APR66	205632				03.29.13.0.
APPRO	RSS	2AUG65	CHECK	BP	17AUG65						

1860045

5400982

REED RELAY LOCATION CHART SELF-CHECK MOD 10

03.29.13.0

RECTIFIERS (2391158) NOTE XV

DIODE NO.	SECT NO.	DIODE NO.	SECT NO.
101CR1	2A	113CR10	5A
101CR2	13A	115CR2B	8B
101CR3	2A	116CR1	6B
101CR4	13A	116CR2	6B
101CR5	2A	117CR1	8B
101CR6	13A	117CR3	6B
101CR7	2A	117CR5	6B
101CR8	13A	119CR10	5A
101CR9	2B	120CR1	6B
101CR10A	8A	120CR10	13A
101CR10B	13A	122CR1	10B
102CR1	2A	122CR2	11A
102CR2	13A		
102CR3	2B	123CR10B	10A
102CR4	13A	124CR3	7B
102CR5	2B	124CR4	9B
102CR6	13A	124CR8	9A
102CR7	2B	124CR9	10B
102CR8	13A		
102CR9	2B	128CR10	14B
103CR3	2A	129CR4	10A
103CR7	2A	130CR10B	10A
105CR1	7B	132CR1	7B
105CR5	8A	132CR5	6B
106CR1	6A	132CR8	10B
106CR10	8A	133CR1	5B
107CR10	5B	134CR10	10B
110CR2	14A	117CR2	8B
110CR10	8A		
111CR1	14A		

DIODE LOCATION (GATE 03)

DIODE	SECT	DIODE	SECT
1	8B	31	22B
2	9B		
3	8A		
4	10B	34	23B
5	8A	35	23B
6	6A	36	19A
7	21B	37	24A
8	20B	38	24A
9	6B	39	24A
10	6B	40	24A
11		41	23A
12		42	23A
13	19B	43	
14		44	23A
15		45	24B
16	21B	46	24B
17	21B	47	24B
18	21B	48	21B
19	21B	49	24B
20	21B	50	24B
21	21B	51	24B
22	21B	52	24B
23	21B	53	24A
24	21B	54	24A
25	21B	55	24A
26	22B	56	24A
27	22B	57	23A
28	22B	58	23A
29	22B	59	22B
30	22B	60	19A

WIRE CONTRACT RELAY LOCATION (GATE 03)

RELAY	NO	P	H	1	2	3	4	5	6	7	8	9	10	11	12	P/N
X-2	332	20B		19A	19A	19A	19A	19A	20A	20A	20A	20A				196186
ALPHA	3	12B	12B		9B	9B	1A	LOCATION (KEYBOARD)								196208
ESC INT	1	12A		10B		9B	12A	LOCATION (CARD TRANSPORT)								104753
XFER INT	362	23B	23B	23A	21B											196208
A8	349	24B	24A	21A	21A	22A	22A	21A	21A	22A	21A	21A	22A		23A	255735
A4	352	24B	24A	22A	22A	21A	21A	22A	21A	21A	22A	21A	21A		23A	255735
A2	355	24B	24A	21A	22A	21A	21A	22A	22A	21A	21A	22A	21A		23A	255735
A1	358	24B	24A	22B	21B	21B	22B	21B	21B	22B	22B	21B	21B		23A	255735
X-81	361	10B	24A	24A												196208
T-1	363	22B	24A	23A	23B	24B		21B	24B	24B	24B	24B	24B	24B		255735
T-8	366	22B	24A	23A	23B	23B	23B		21B							196198
T-4	368	22B	24A	23A	23B	23B	23B	23B	21B							196198
T-2	369	22B	24A	23A	23B	24B	24B	24B	24B							196198
TEST	371	20B	24A	23A	23B			23A	7A	22B	10A		23B	23A		255735
FIELD-I	374	20B	20B	20B	23B	23A	22B									196208
OK	375	24B	24A	24A	10B	10B										196208
FIELD-II	376	21B	21B	21B	20B	1A	23A	10A	21B							196198
ERROR	377	24B	24B	9A	7A	7A	24A	9B	10B							186686
MULTI-PCH	378		6A	21B	10B	9B										196208
SC-PRO-SEL	379		8B	19B	19B	19B	19B									196198
FIELD II	382	22B	22B		1A											196208
SC-REL	383		6B	20B	10A											196208
GEN	384		24A	24A	23B	23B	7A	22B	23B							196198

ARC SUPP P/N 328602

	A	B	C	D
247-1		18B	18B	18B

FEATURE REED RELAY LOCATION

RELAY	NO	COIL	1	2	3	4	5	6	PART NO
MCT	119	6A	6A	7B	7B	5A	5A	7B	766076
AUX DUP	130	2B	1B		2B				766073
HSS 1 & 2		NOTE XVII							

CONNECTOR CHART

PIN	01A	01B	01C	01D	01E	01F	Z	03A	03B	03C
1		14B	1A				2A	21B		1A
2	6A	2A	3A		9A		1A	19A	19A	19A
3	7B	11A	6A**		12A		*		11A	2A
4	2A	2B	14B	8A			1A	17A	19A	19A
5		1B	5A	9B	9A		1A	7B	23B	10A
6	2A		2A	7B			1A	17A	19A	2A
7	6A		6B	8A			1A		21A	9A
8	2A	2B	12B	6A	6A		1A		19A	1B
9	5A		2B**		11A		1A			6B
10	2A	2B	1A	9A	5A		1B		20A	1B
11	7B	2B**	1B	9B	9A		1B		23B	8B
12	2B	2A	5A	9A	5B		2A		20A	
13	6A**	2B	5A	9B	10A		1B			8B
14	2B	2B	3B	11B			6A	19A	8B	
15	9B	9B	5A	9A			6A		9B	6A
16	2A	2B	3B	11B	5B		8B	19A	9B	
17	1B	9A	9A	9A			7B		9A	
18	2A	2A	*		11B		8B		9A	
19		9B	2A	8B			1B		9B	1A
20	2A	5B	10A		5B		11B	23B	23A	
21	8B		10B	9B	10B		14B		2A	24A
22	2A	2A	8A	8B			9B			
23	5A	11A	8B		5B		*	6B		24A
24	9B	2A	6A	10B			*			
25	**7B	1B	8A	6A			4B		9B	24A
26	2B		**8B	8A	8B		5B		20A	
27	7B**	9B	9A				4B			8A
28	2B	2A	5A	9A	11A		2B**	23A	20A	
29	8A	5A	10B	12A						
30	2B	7A						23A	20A	

*LOCATION SHOWN ON REFERENCE PAGE
**NOTE XVIII

ARC SUPP ASSEMBLIES (NOTE XI)

MAGNET	ARC SUPP PART NO	LOC
DIODE ASM	5400887	
KYBD RESTRAIL CT	5372368	1A
INDUCTOR ASM	5400916	
CAPACITOR	5400889	
CD FD CLUTCH MAG	2160917	6A
RESISTOR ASM	5400888	
ESC INT RELY	347820	12A
CAP ASM (SHORT L'D	5400890	
CAPACITOR ASM	315692	
RESISTOR ASM	1127186	

READ RELAY LOCATION

RELAY	NO	COIL	1	2	3	4	5	6	PART NO
PROG SELECT	106	8A	9A	9A	11B	11B			766073
CLEAR I	107	6B	6B	6A	5A	5B	5A	5B	NOTE XIII
CLEAR II	108	6B	5B	5A	6B			6B	766075
CARD LEVER	110	8B	9B		8A	5A			766073
PRINT	111	14A	14A	14B		14B			766073
CARD LEVER	112	8B	8B		9B	5A	1A	9A	766076
MULTI-PCH	113	6A	5A	10B	9B	9A	10B	11A	766075
PROG-SELECT	115	8A	8A	9B	9B	9A	9A	8B	766076
DUP I	116	10A	10A	10A	11A	11B	10A		766071
SKIP	117	10A	7B						NOTE XIV
DUP II	120	10A	1B		10A	10A			766073
RELEASE	121	6B	10B	6B	5A		7B	9B	NOTE XIII
DUP II	122	10A	9B	11A	6A	10A			NOTE XII
SKIP	123	10B	10B	13B	9B	10A	2A	9B	766075
ESCAPE INT'L	131	12A	12A	11A		10A	10A	10B	766075
DUP I	114	10A	7B	9B	10B	10A			NOTE XII

RESISTOR & CAPACITOR LOCATION

PART NO	RES CAP #	SECT
597682	115R10	8A
317428	126R1	1B
301149	128R4	1B
217077	128C4	1B
317014	134R4	10B
482145	134C1	10B
5404302	470Ω	7A

RACE RELAY#	SUB RELAY#
766071	765700
766073	765722
766075	765725
766076	765726
766086	765825

NOTE XVI

PUNCH (P) CAMS

NO	LOC	PART NO	M	B
1	12A	309630	180°±1°	0°±3°
2	11A	309634	149°±3°	79°±2°
3	9A	227694	10°±1°	60°±3°
4	10A	309630	175°±3°	355°±2°
5	1B	309629	86°±3°	166°±2°
6	23A	310255	53°±3°	3°±2°
7	23A	309631	241°±3°	166°±2°

CARD FEED (CF) CAMS

NO	SECT	PART NO	M	B
1				
2	5B	309630	355°±2°	180°±5°
3	7B	309631	70°±2°	150°±5°
4	7B	309631	5°±2°	85°±5°
6	11B	313807	340°±5°	75°±2°

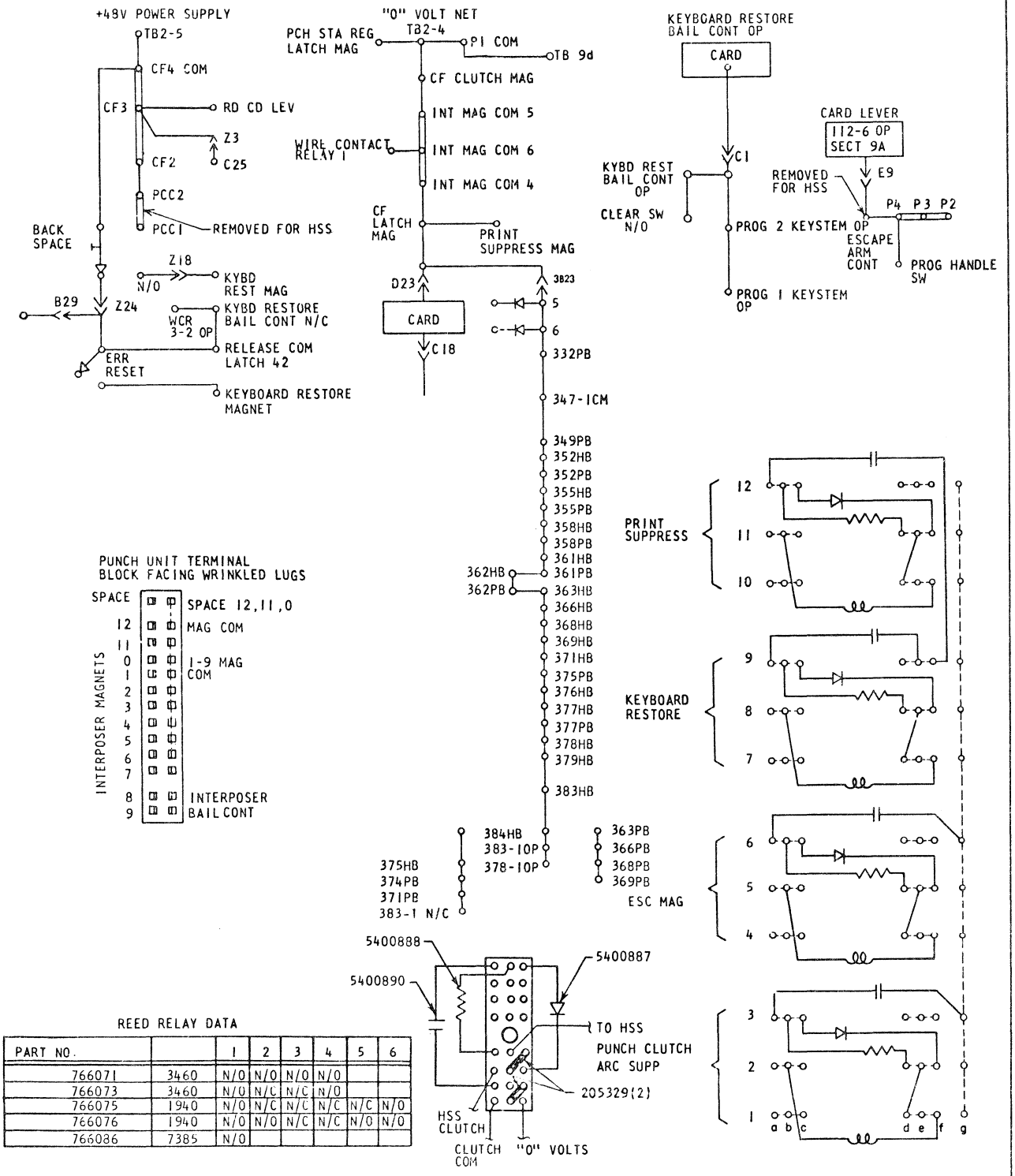
NOTES

XI ARC SUPP ASSEMBLIES WITHOUT LOC ARE LOCATED ON ARC SUPPRESSION TB
XII PART NUMBER 766073 MUST BE USED
XIII PART NUMBER 766076 MUST BE USED
XIV PART NUMBER 766086 MUST BE USED
XV PART NUMBER 2111232 MAY BE SUBSTITUTED
XVI SUBSTITUTE RELAYS LISTED IN CHART ARE NOT TO BE USED AS PER NOTES XII, XIII AND XIV
XVII HSS RELAY POINT ARE ALL LOCATED ON HSS LOGIC PAGE
XVIII THESE POINTS DO NOT APPEAR ON STANDARD PAGES THEY APPEAR ONLY ON FEATURE PAGES

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			28SEP65	205391			X PRINT TO ENG. SPEC. NO. 895291	
	03.29.13.0			28OCT65	205425C				
DESIGN	WPT	2AUG65	MODEL	20DEC65	205425E				
DETAIL				11 MAR 66	205542				
CHECK	MB	2AUG65	DRAF VE 5AUG65	11APR66	205632				03.29.13.0
APPRO	RSS	2AUG65	CHECK BP 17AUG65						

5400982

REED RELAY SELF-CHECK MOD 10



REED RELAY DATA

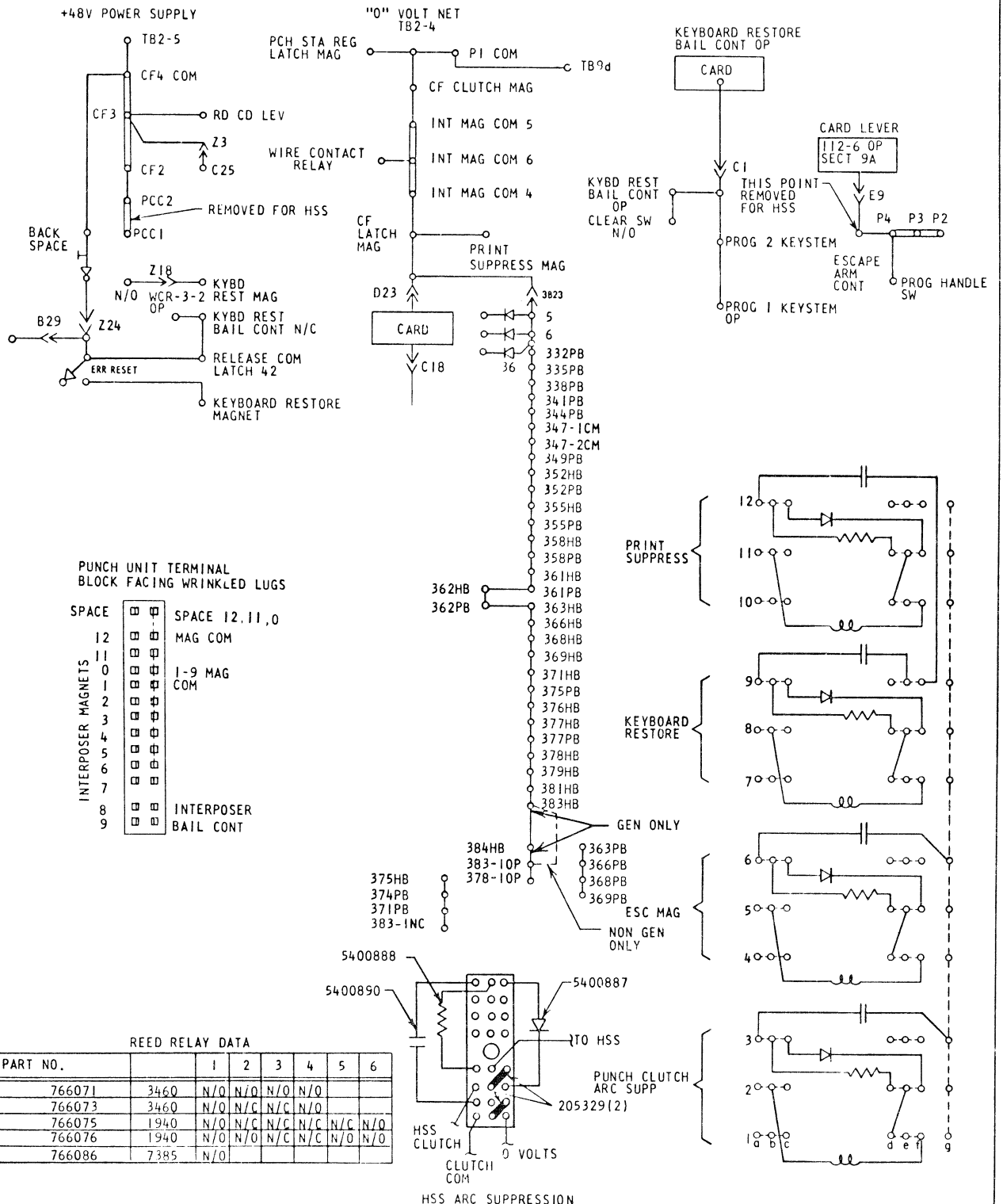
PART NO.		1	2	3	4	5	6
766071	3460	N/O	N/O	N/O	N/O		
766073	3460	N/O	N/C	N/C	N/O		
766075	1940	N/O	N/C	N/C	N/C	N/C	N/O
766076	1940	N/O	N/O	N/C	N/C	N/O	N/O
766086	7385	N/O					

HSS ARC SUPPRESSION

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					28SEP65	205391			X PRINT TO ENG. SPEC. NO.	
	03.29.14.0					28OCT65	205425C			895291	
DESIGN	WPT	2AUG65	MODEL			20DEC65	205425E				
DETAIL											
CHECK	MB	2AUG65	DRAW	VE	4AUG65						03.29.14.0
APPRO	RSS	2AUG65	CHECK	ESP	17AUG65						

5400983

REED RELAY SELF-CHECK MOD 11



HSS ARC SUPPRESSION

REED RELAY DATA

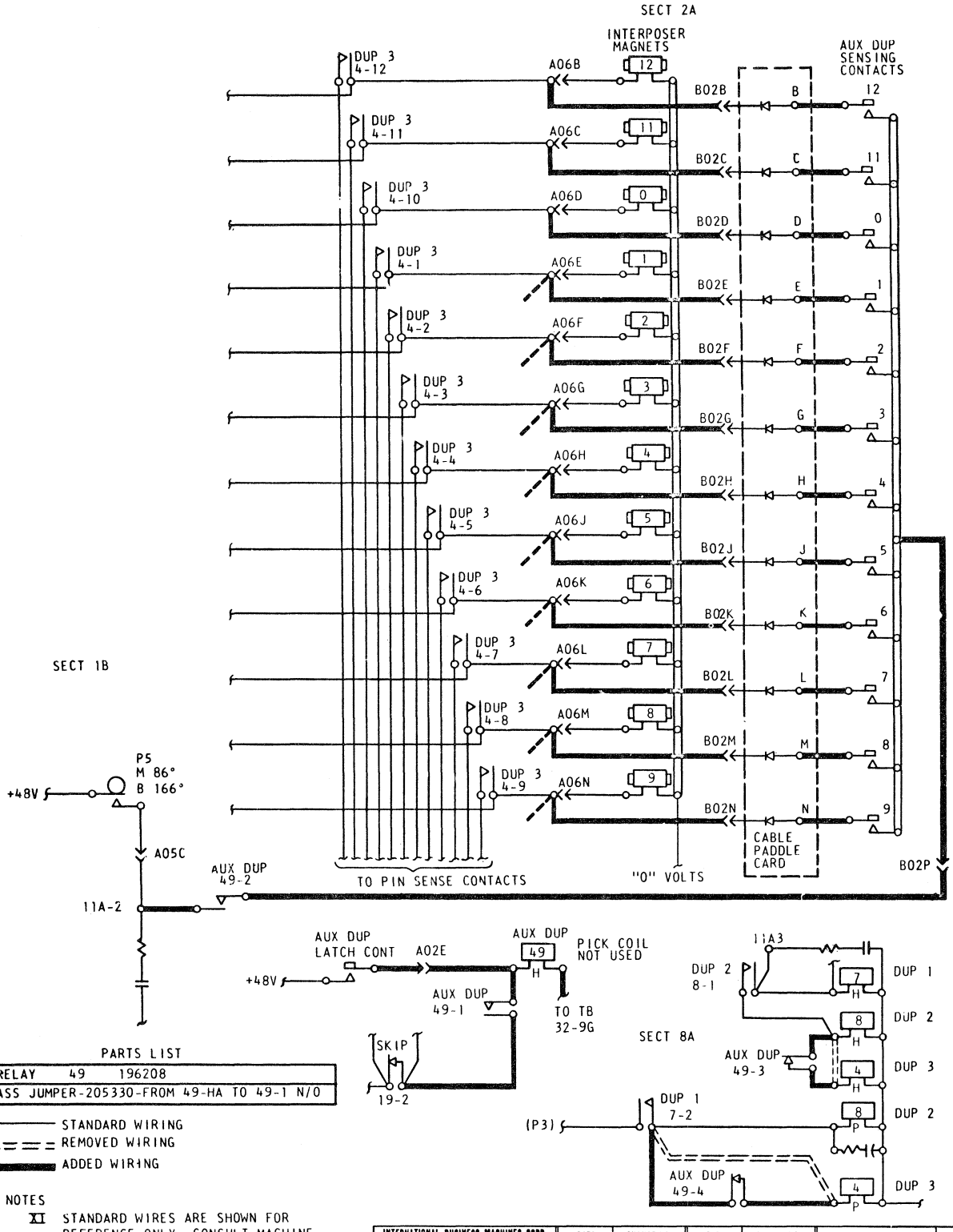
PART NO.		1	2	3	4	5	6
766071	3460	N/O	N/O	N/O	N/O		
766073	3460	N/O	N/C	N/C	N/O		
766075	1940	N/O	N/C	N/C	N/C	N/C	N/O
766076	1940	N/O	N/O	N/C	N/C	N/O	N/O
766086	7385	N/O					

INTERNATIONAL BUSINESS MACHINES CORP.	DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME: SYSTEMS DIAGRAM 03.29.14.0	28SEP65	205391			A PRINT TO ENG. SPEC. NO. 895291	
DESIGN WPT 2AUG65 MODEL	28OCT65	205425C				
DETAIL	20DEC65	205425E				
CHECK MB 2AUG65 EXAM VE 5AUG65						03.29.14.0
APPRO HSS 2AUG65 CHECK [illegible]						

5400984

W/C

AUXILIARY DUPLICATION
AUX DUP



PARTS LIST

RELAY	49	196208
BRASS JUMPER-205330-FROM 49-HA TO 49-1 N/O		

STANDARD WIRING
REMOVED WIRING
ADDED WIRING

NOTES

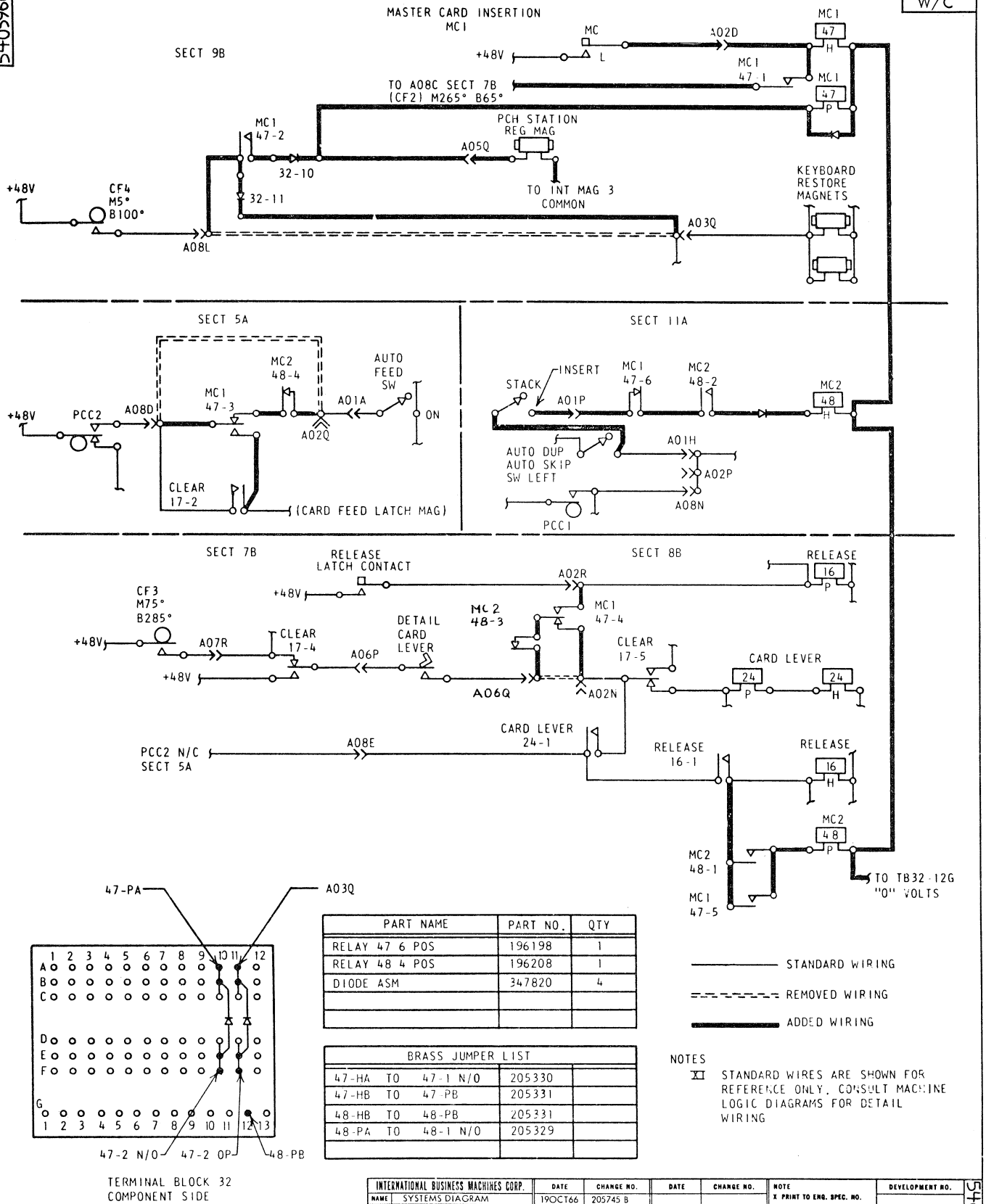
XI STANDARD WIRES ARE SHOWN FOR REFERENCE ONLY. CONSULT MACHINE LOGIC DIAGRAMS FOR DETAIL WIRING

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					19OCT66	205745 B			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	15EP66	MODEL								
DETAIL											
CHECK	RAS	15EP66	DRAW	IDI	18OCT66						
APPRO	FH	35EP66	CHECK								

5405965

5405966

W/C



TERMINAL BLOCK 32
COMPONENT SIDE

PART NAME	PART NO.	QTY
RELAY 47 6 POS	196198	1
RELAY 48 4 POS	196208	1
DIODE ASM	347820	4

BRASS JUMPER LIST			
47-HA	TO	47-1 N/O	205330
47-HB	TO	47-PB	205331
48-HB	TO	48-PB	205331
48-PA	TO	48-1 N/O	205329

STANDARD WIRING

REMOVED WIRING

ADDED WIRING

NOTES

1. STANDARD WIRES ARE SHOWN FOR REFERENCE ONLY. CONSULT MACHINE LOGIC DIAGRAMS FOR DETAIL WIRING

INTERNATIONAL BUSINESS MACHINES CORP.					DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM				19OCT66	205745 B			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	15EP66	MODEL							
DETAIL										
CHECK	RAS	15EP66	DRAW	18OCT66						
APPRO	FH	35EP66	CHECK							

5405966

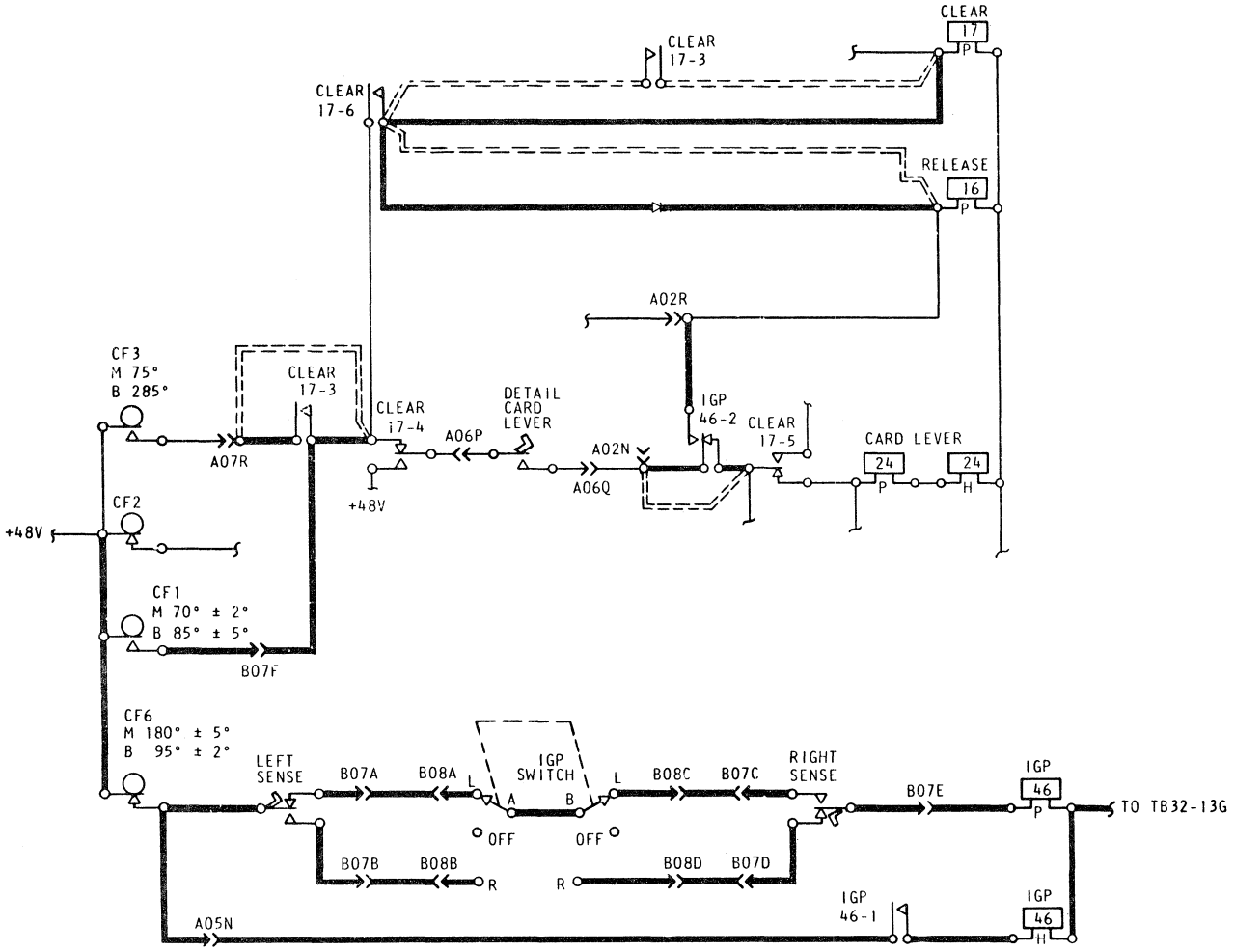
5405287

W/C

INTERSPERSED GANG PUNCH
IGP

SECT 7B

SECT 8B



PART NAME	PART NO.
CAM CF-1	311384
CAM CF-6	315381
RELAY 46	196208
SWITCH IGP	382297
SWITCH RIGHT SENSE	5404396
SWITCH LEFT SENSE	5404296
DIODE ASM	347820

BRASS JUMPER		
FROM	TO	PART NO.
46-HA	46-1 N/O	205330
46-HB	46-PB	205331
17-3 N/O	17-4 N/C	205330

STANDARD WIRING
REMOVED WIRING
ADDED WIRING

NOTES
XI STANDARD WIRES ARE SHOWN FOR REFERENCE ONLY. CONSULT MACHINE LOGIC DIAGRAMS FOR DETAIL WIRING

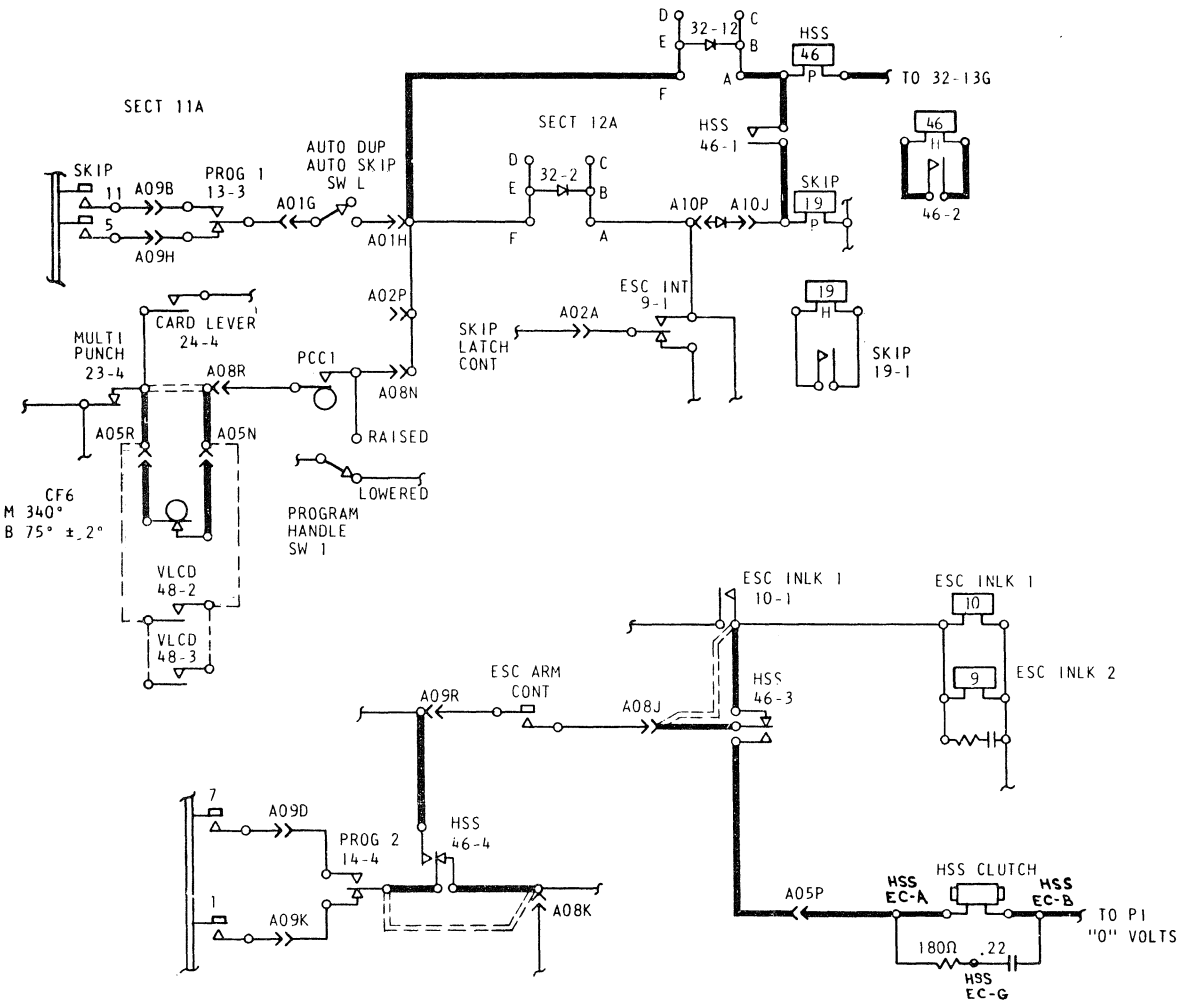
INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					19OCT66	205745 B.			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	15EP66	MODEL								
DETAIL											
CHECK	RAS	15EP66	DRAW	IDI	18OCT66						
APPRO	FH	3SEP66	CHECK								

5405967

5405968

W/C

HIGH SPEED SKIP
HSS



STANDARD WIRING

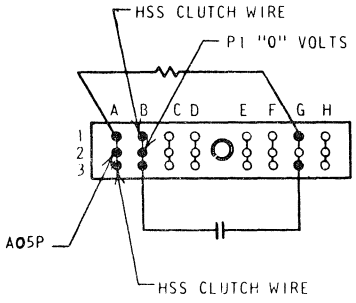
REMOVED WIRING

ADDED WIRING

ADDED WIRING ON MACH WITH BOTH HSS AND VLCD INSTALLED

PARTS LIST	
RELAY 46	196208
DIODE	347820
RESISTOR 180Ω	5820454
CAPACITOR .22 MFD	5400890

BRASS JUMPER LIST		
FROM	TO	PART NO.
46-PA	46-1 N/O	205329
46-11A	46-2 N/O	205329



EDGE CONNECTOR IS LOCATED ON HSS UNIT

NOTES

XI STANDARD WIRES ARE SHOWN FOR REFERENCE ONLY. CONSULT MACHINE LOGIC DIAGRAMS FOR DETAIL WIRING

INTERNATIONAL BUSINESS MACHINES CORP.					
NAME	SYSTEMS DIAGRAM				
DESIGN	AG	15EP66	MODEL		
DETAIL					
CHECK	RAS	15EP66	DRAW	IDI	190CT66
APPRO	FH	35EP66	CHECK		

DATE	CHANGE NO.	DATE	CHANGE NO.
190CT66	205745 B		

NOTE
X PRINT TO ENG. SPEC. NO.
895291

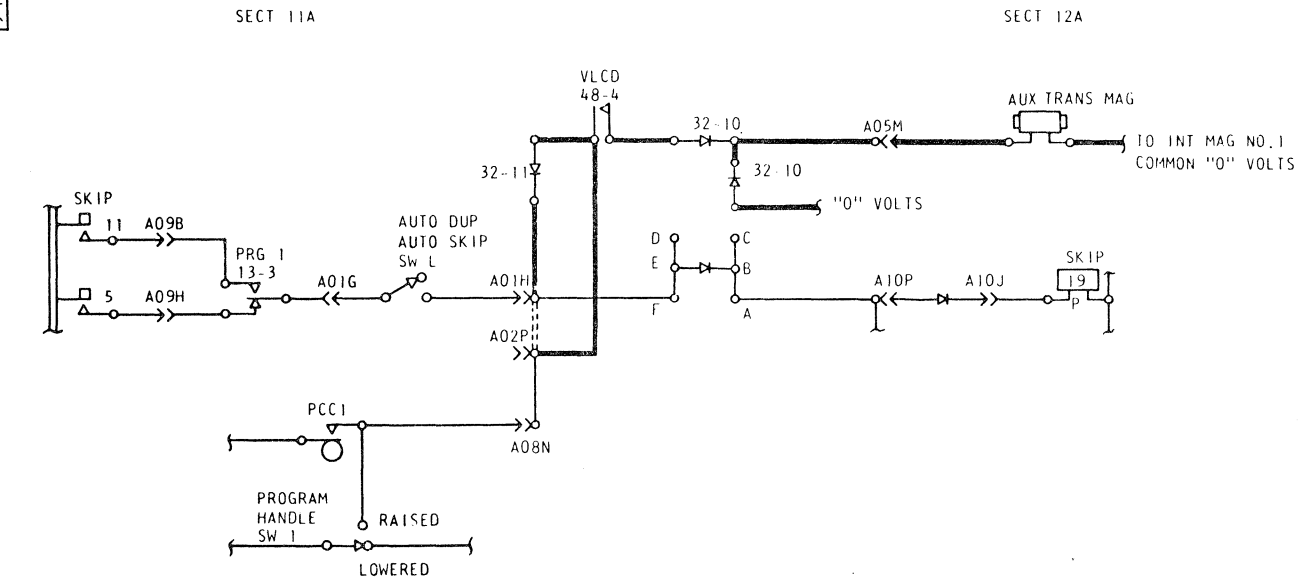
DEVELOPMENT NO.

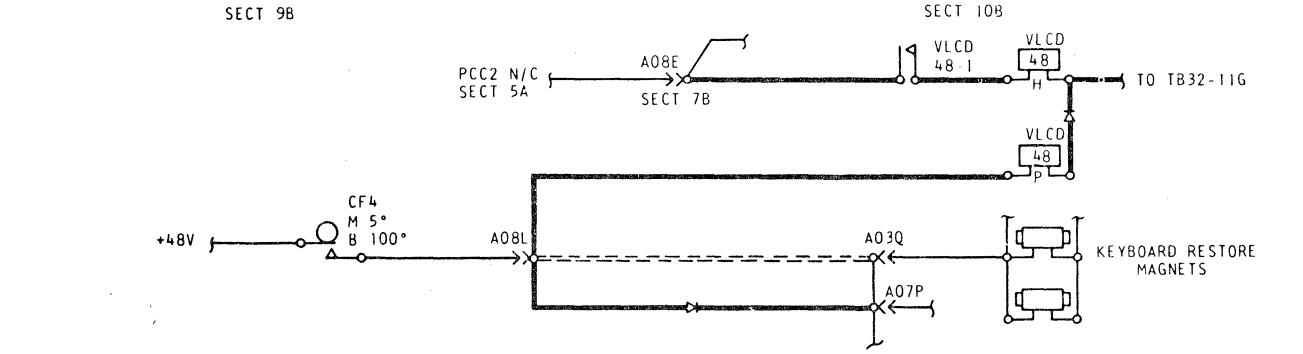
5405968

5405969

W/C

VARIABLE LENGTH CARD DEVICE
VLCD

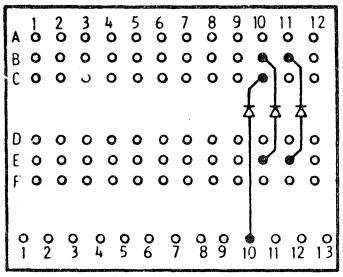




STANDARD WIRING

REMOVED WIRING

ADDED WIRING



TERMINAL BLOCK 32
COMPONENT SIDE

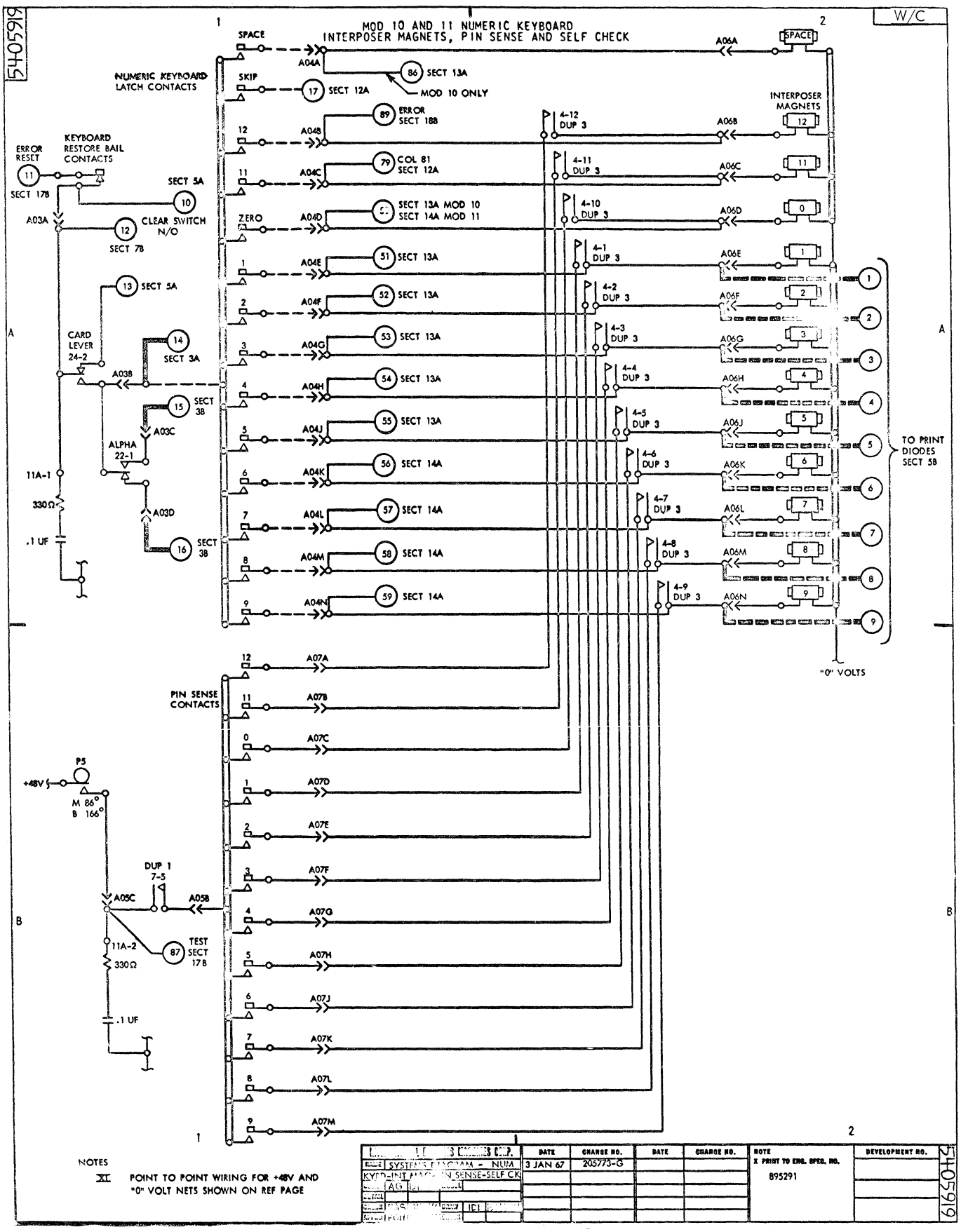
PART	DESCRIPTION	PART NO.	QTY
RELAY 48	VLCD 4 POS	196208	1
DIODE A	PLUG TYPE	347820	4
DIODE A	SLIP ON	5404119	1
BRASS JUMPER 48 HA-48-1 N/O 205331			

NOTES

1. STANDARD WIRES ARE SHOWN FOR REFERENCE ONLY. CONSULT MACHINE LOGIC DIAGRAMS FOR DETAIL WIRING.

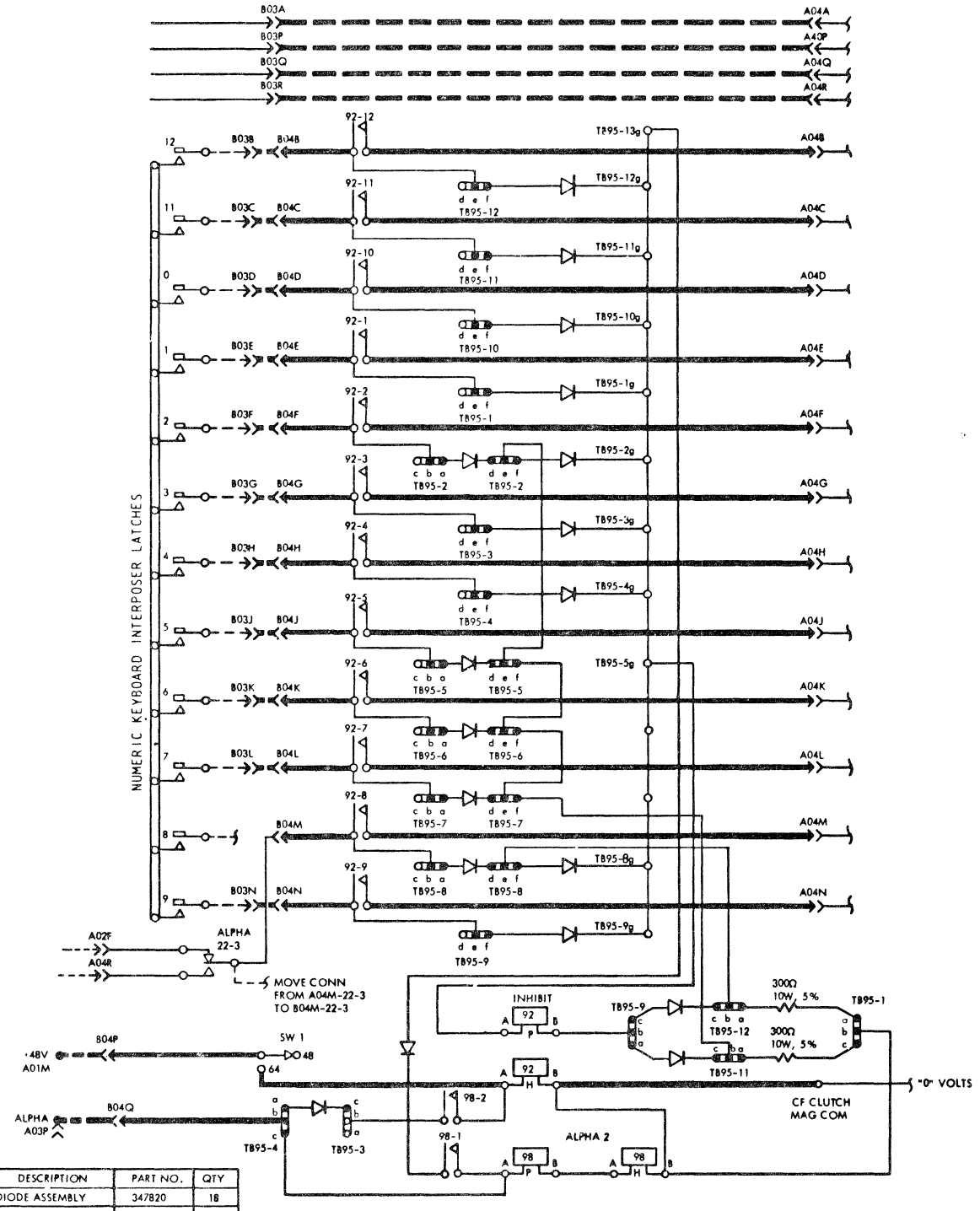
INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					19OCT66	205745 B			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	15EP66	MODEL								
DETAIL											
CHECK	RAS	15EP66	DRAW	IDI	18OCT66						
APPRO	FH	35EP66	CHECK								

5405969


MOD 10 AND 11 NUMERIC KEYBOARD
INTERPOSER MAGNETS, PIN SENSE AND SELF CHECK
W/C
NUMERIC KEYBOARD LATCH CONTACTS
KEYBOARD RESTORE BAIL CONTACTS
ERROR RESET
SECT 17B
SECT 5A
CLEAR SWITCH N/O
SECT 7B
CARD LEVER 24-2
SECT 3A
ALPHA 22-1
11A-1
330Ω
.1 UF
SECT 38
SPACE
SKIP
ZERO
SECT 12A
MOD 10 ONLY
ERROR SECT 18B
COL 81 SECT 12A
SECT 13A MOD 10
SECT 14A MOD 11
SECT 13A
SECT 14A
INTERPOSER MAGNETS
TO PRINT DIODES SECT 5B
"0" VOLTS
PIN SENSE CONTACTS
P5
+48V
M 86°
B 166°
DUP 1 7-5
11A-2
TEST SECT 17B
NOTES
POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
DATE
CHANGE NO.
3 JAN 67
205773-G
X PRINT TO ENG. SPEC. NO.
895291
DEVELOPMENT NO.
540519

W/C

W D IBM 29 CHARACTER INHIBIT FEATURE
WCR
1



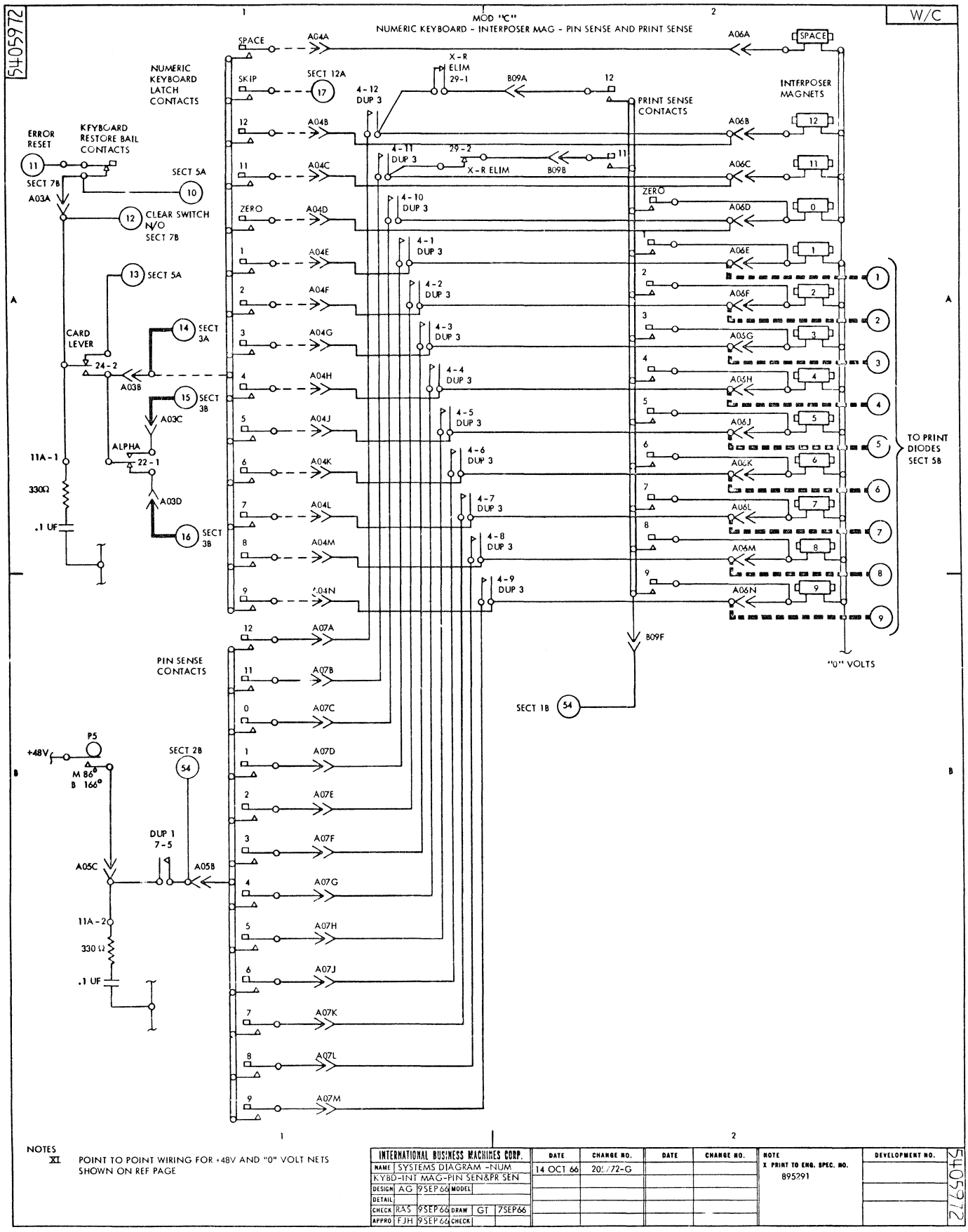
DESCRIPTION	PART NO.	QTY
DIODE ASSEMBLY	347820	18
RESISTOR ASSEMBLY	5462471	2
RELAY, R92	255735	1
RELAY, R98	196208	1

ADDED CABLE WIRING

ADDED JUMPER WIRES

INTERNATIONAL BUSINESS MACHINES CORP.					DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM				28APR67	205975A			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	WRC	3MAR67	MODEL							
DETAIL										
CHECK	RAS	3MAR67	DRAW	idj	7APR67					
APPRD	RJE	3MAR67	CHECK							

5462478

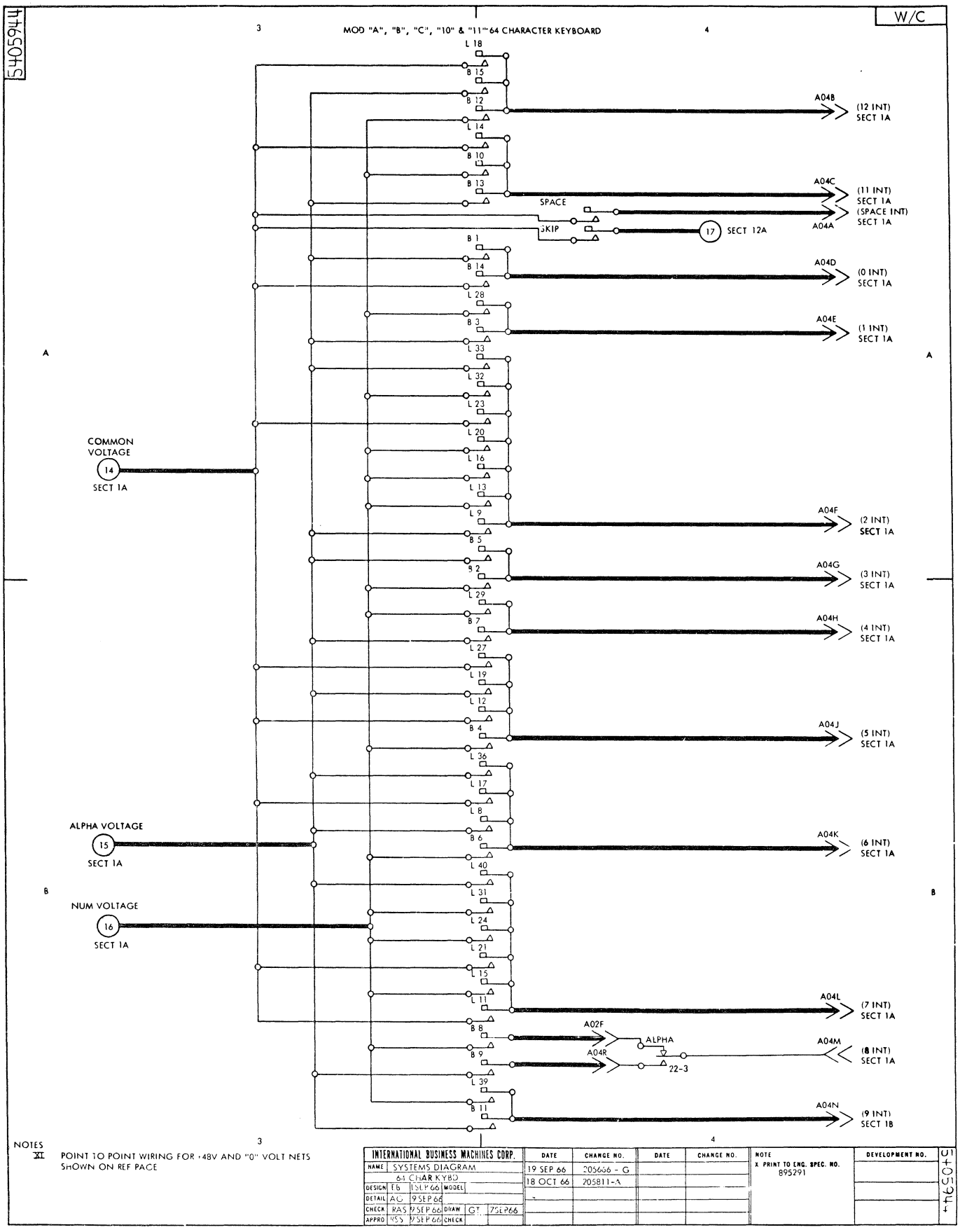


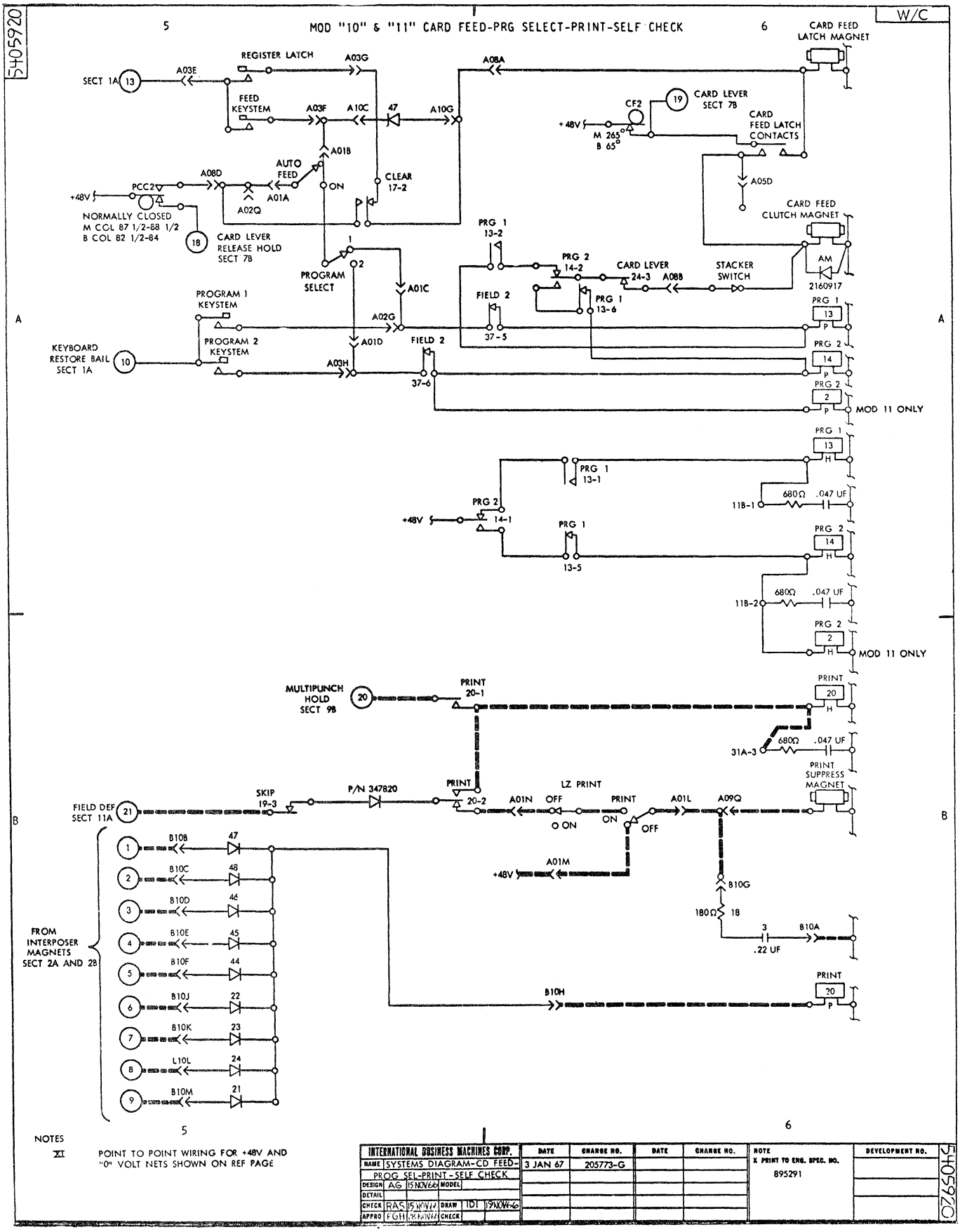
NOTES

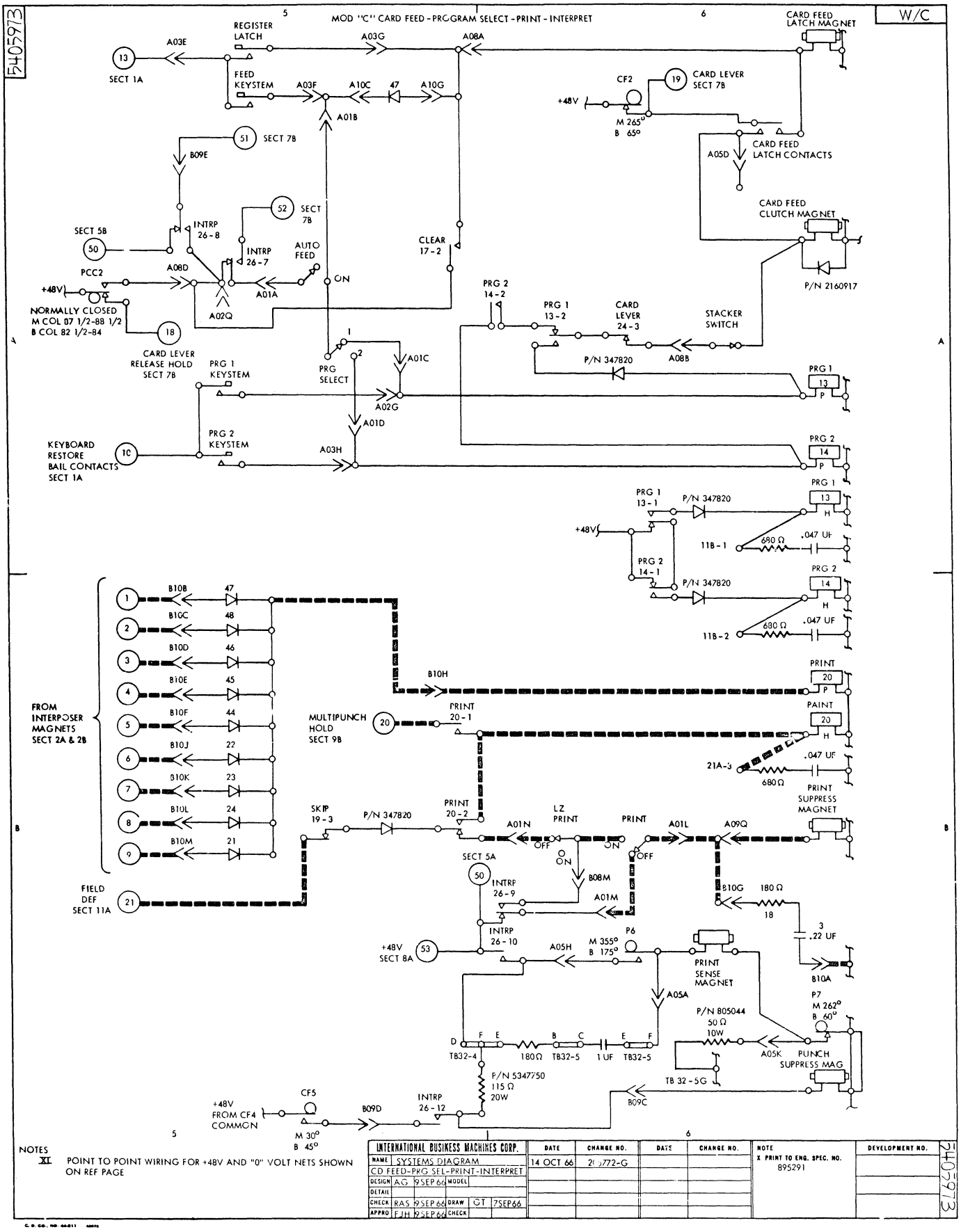
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

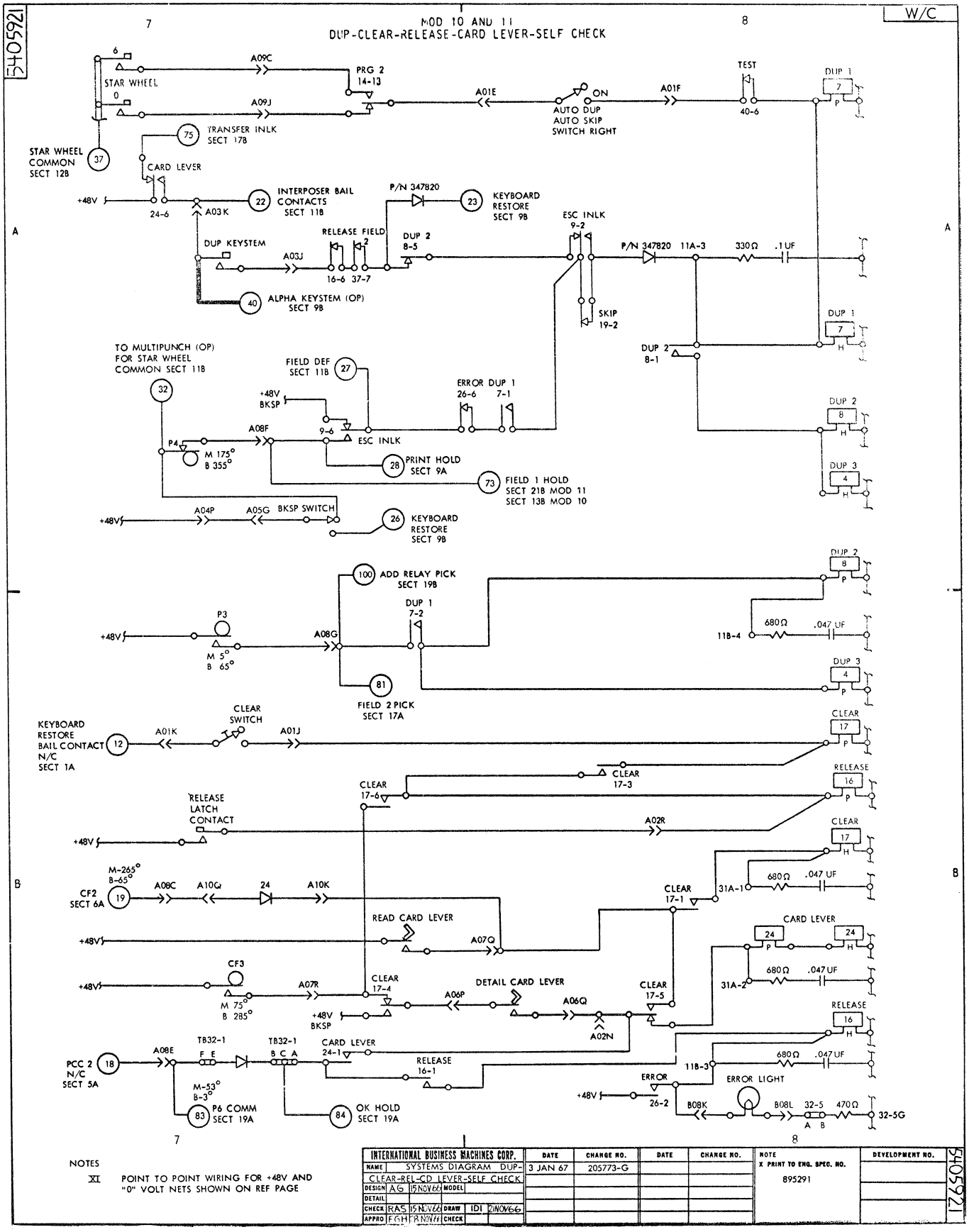
INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM -NUM KYBD-INT MAG-PIN SEN&PR SEN					14 OCT 66	20[illegible]72-G			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	9SEP66	MODEL								
DETAIL											
CHECK	RAS	9SEP66	DRAW	GT	7SEP66						
APPRO	FJH	9SEP66	CHECK								

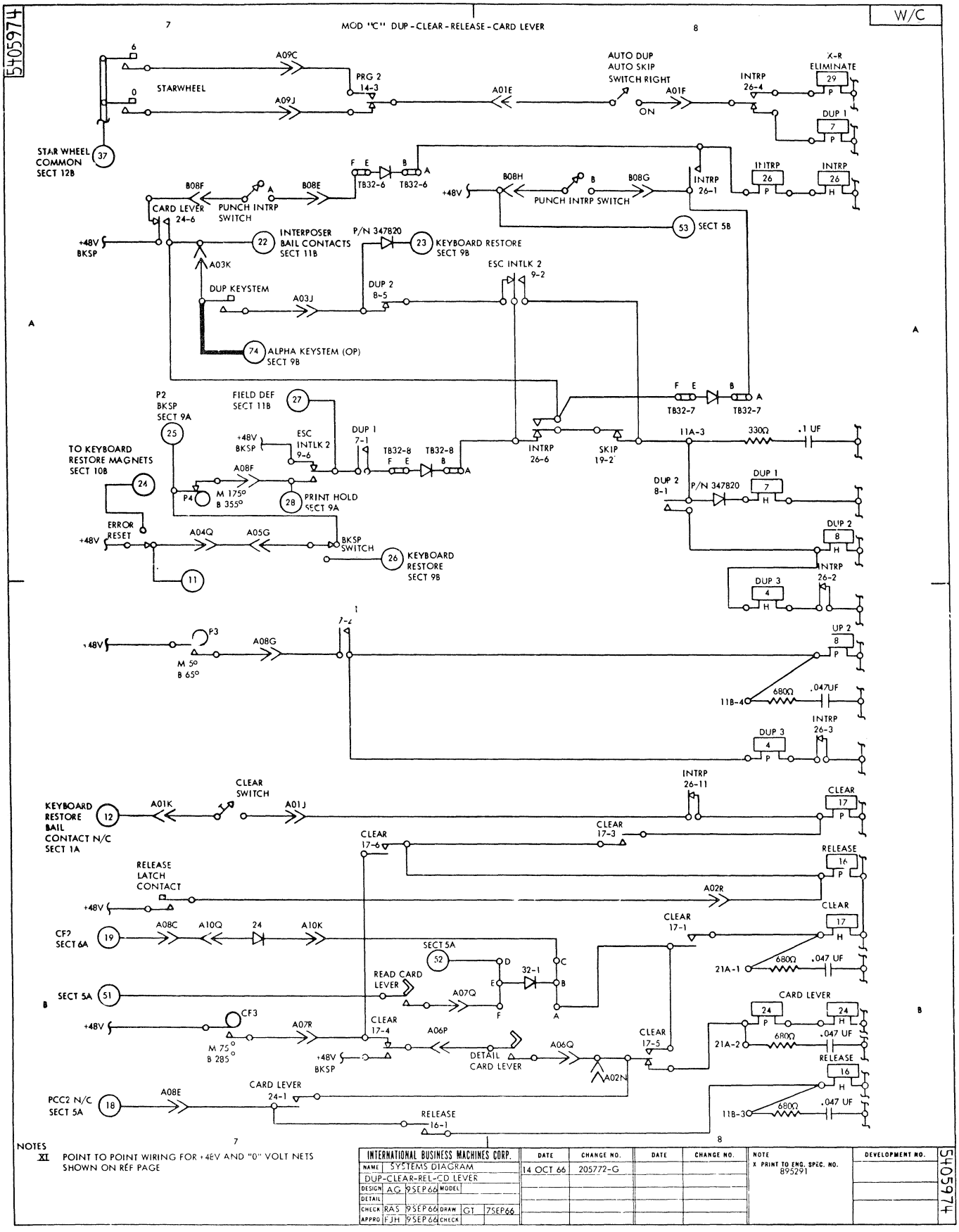
5405972


5405944
W/C
MOD "A", "B", "C", "10" & "11" 64 CHARACTER KEYBOARD
L 18
B 15
B 12
A04B
(12 INT)
SECT 1A
L 14
B 10
B 13
A04C
(11 INT)
SECT 1A
SPACE
(SPACE INT)
SECT 1A
A04A
SKIP
17
SECT 12A
B 1
B 14
A04D
(0 INT)
SECT 1A
L 28
B 3
A04E
(1 INT)
SECT 1A
L 33
L 32
L 23
L 20
L 16
L 13
COMMON VOLTAGE
14
SECT 1A
L 9
A04F
(2 INT)
SECT 1A
B 5
9 2
A04G
(3 INT)
SECT 1A
L 29
B 7
A04H
(4 INT)
SECT 1A
L 27
L 19
L 12
B 4
A04J
(5 INT)
SECT 1A
L 36
L 17
L 8
ALPHA VOLTAGE
15
SECT 1A
B 6
A04K
(6 INT)
SECT 1A
L 40
L 31
NUM VOLTAGE
16
SECT 1A
L 24
L 21
L 15
L 11
A04L
(7 INT)
SECT 1A
B 8
A02F
ALPHA
B 9
A04R
22-3
A04M
(8 INT)
SECT 1A
L 39
B 11
A04N
(9 INT)
SECT 1B
NOTES
XI
POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
64 CHAR KYBD
DESIGN EB 15EP66 MODEL
DETAIL AC 9SEP66
CHECK RAS 9SEP66 DRAW GT 7SEP66
APPRO WSS 9SEP66 CHECK
DATE
CHANGE NO.
19 SEP 66
205666 - G
18 OCT 66
205811-A
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405944


5405920
MOD "10" & "11" CARD FEED-PRG SELECT-PRINT-SELF CHECK
W/C
CARD FEED LATCH MAGNET
REGISTER LATCH
A03G
A08A
SECT 1A
13
A03E
FEED KEYSTEM
A03F
A10C
47
A10G
CF2
19
CARD LEVER SECT 7B
+48V
M 265°
B 65°
CARD FEED LATCH CONTACTS
A01B
AUTO FEED
A08D
PCC2
ON
CLEAR 17-2
A05D
+48V
A01A
A02Q
NORMALLY CLOSED
M COL 87 1/2-88 1/2
B COL 82 1/2-84
18
CARD LEVER RELEASE HOLD SECT 7B
CARD FEED CLUTCH MAGNET
PRG 1 13-2
PROGRAM SELECT
1
2
A01C
PRG 2 14-2
CARD LEVER 24-3
A08B
STACKER SWITCH
AM 2160917
PROGRAM 1 KEYSTEM
FIELD 2
PRG 1 13-6
PRG 1 13 P
A
A02G
A
PROGRAM 2 KEYSTEM
A01D
FIELD 2
37-5
PRG 2 14 P
KEYBOARD RESTORE BAIL
10
SECT 1A
A03H
37-6
PRG 2 2 P
MOD 11 ONLY
PRG 1 13 H
PRG 1 13-1
680Ω .047 UF
11B-1
PRG 2
+48V
14-1
PRG 1
PRG 2 14 H
13-5
680Ω .047 UF
11B-2
PRG 2 2 H
MOD 11 ONLY
MULTIPUNCH HOLD SECT 9B
20
PRINT 20-1
PRINT 20 H
680Ω .047 UF
31A-3
PRINT SUPPRESS MAGNET
FIELD DEF
SECT 11A
21
SKIP 19-3
P/N 347820
PRINT 20-2
A01N
OFF
ON
LZ PRINT
PRINT
ON
OFF
A01L
A09Q
B
B
A01M
+48V
B10G
180Ω
18
3
.22 UF
B10A
PRINT 20 P
B10H
FROM INTERPOSER MAGNETS SECT 2A AND 2B
1 B10B 47
2 B10C 48
3 B10D 46
4 B10E 45
5 B10F 44
6 B10J 22
7 B10K 23
8 L10L 24
9 B10M 21
5
6
NOTES
XI
POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM-CD FEED-
PROG SEL-PRINT-SELF CHECK
DESIGN AG 15NOV66
DETAIL
CHECK RAS 15NOV66
APPRO FGH 15NOV66
DRAW IDI 19NOV66
CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ERG. SPEC. NO. 895291
DEVELOPMENT NO.
5405920


5405973
MOD "C" CARD FEED - PROGRAM SELECT - PRINT - INTERPRET
W/C
REGISTER LATCH
A03E
A03G
A08A
CARD FEED LATCH MAGNET
SECT 1A
FEED KEYSTEM
A03F
A10C
47
A10G
A01B
CF2
CARD LEVER SECT 7B
+48V
M 265°
B 65°
A05D
CARD FEED LATCH CONTACTS
SECT 7B
B09E
CARD FEED CLUTCH MAGNET
SECT 5B
INTRP 26-8
INTRP 26-7
AUTO FEED
CLEAR 17-2
PCC2
A08D
ON
A01A
A02Q
PRG 2 14-2
PRG 1 13-2
CARD LEVER 24-3
STACKER SWITCH
P/N 2160917
NORMALLY CLOSED
M COL 07 1/2-88 1/2
B COL 82 1/2-84
CARD LEVER RELEASE HOLD SECT 7B
PRG SELECT
A01C
P/N 347820
A08B
PRG 1 KEYSTEM
A02G
PRG 1
PRG 2 KEYSTEM
A01D
KEYBOARD RESTORE BAIL CONTACTS SECT 1A
A03H
PRG 2
PRG 1 13-1
P/N 347820
680 Ω
.047 UF
11B-1
PRG 2 14-1
11B-2
FROM INTERPOSER MAGNETS SECT 2A & 2B
B10B
B10C
B10D
B10E
B10F
B10J
B10K
B10L
B10M
47
48
46
45
44
22
23
24
21
B10H
PRINT
PAINT
MULTIPUNCH HOLD SECT 9B
PRINT 20-1
21A-3
PRINT SUPPRESS MAGNET
SKIP 19-3
PRINT 20-2
LZ PRINT
A01N
A01L
A09Q
OFF
ON
SECT 5A
B08M
A01M
B10G
180 Ω
18
.22 UF
FIELD DEF SECT 11A
INTRP 26-9
INTRP 26-10
+48V SECT 8A
A05H
M 355°
B 175°
P6
PRINT SENSE MAGNET
B10A
A05A
P7
M 262°
B 60°
P/N 805044
50 Ω
10W
D
F
E
B
C
E
F
TB32-4
180Ω
TB32-5
1 UF
TB32-5
A05K
PUNCH SUPPRESS MAG
TB 32-5G
P/N 5347750
115 Ω
20W
B09C
CF5
+48V FROM CF4 COMMON
INTRP 26-12
B09D
M 30°
B 45°
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
CD FEED-PRG SEL-PRINT-INTERPRET
DESIGN AG 9SEP66
DETAIL
CHECK RAS 9SEP66
APPRO FJH 9SEP66
DRAW GT 7SEP66
CHECK
DATE 14 OCT 66
CHANGE NO. 2[illegible]772-G
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
2405973


5405921
MOD 10 AND 11
DUP-CLEAR-RELEASE-CARD LEVER-SELF CHECK
W/C
STAR WHEEL
A09C
PRG 2 14-13
A09J
A01E
ON
AUTO DUP
AUTO SKIP
SWITCH RIGHT
A01F
TEST
40-6
DUP 1
TRANSFER INLK SECT 17B
STAR WHEEL COMMON SECT 12B
CARD LEVER
+48V
24-6
A03K
INTERPOSER BAIL CONTACTS SECT 11B
P/N 347820
KEYBOARD RESTORE SECT 9B
ESC INLK
9-2
DUP KEYSTEM
A03J
RELEASE FIELD
DUP 2
8-5
16-6 37-7
ALPHA KEYSTEM (OP) SECT 9B
P/N 347820 11A-3
330Ω .1UF
SKIP
19-2
TO MULTIPUNCH (OP) FOR STAR WHEEL COMMON SECT 11B
FIELD DEF SECT 11B
ERROR DUP 1
26-6 7-1
+48V BKSP
A08F
9-6
ESC INLK
P4
M 175°
B 355°
PRINT HOLD SECT 9A
FIELD 1 HOLD SECT 21B MOD 11 SECT 13B MOD 10
A04P
A05G BKSP SWITCH
+48V
KEYBOARD RESTORE SECT 9B
ADD RELAY PICK SECT 19B
DUP 1
7-2
P3
M 5°
B 65°
A08G
FIELD 2 PICK SECT 17A
11B-4
680Ω .047 UF
DUP 3
KEYBOARD RESTORE BAIL CONTACT N/C SECT 1A
CLEAR SWITCH
A01K
A01J
CLEAR
17
CLEAR
17-3
CLEAR
17-6
RELEASE
16
RELEASE LATCH CONTACT
A02R
M-265°
B-65°
CF2 SECT 6A
A08C
A10Q
24
A10K
CLEAR
17-1
31A-1
680Ω .047 UF
READ CARD LEVER
A07Q
CARD LEVER
24
CF3
M 75°
B 285°
A07R
CLEAR
17-4
A06P
DETAIL CARD LEVER
A06Q
CLEAR
17-5
31A-2
680Ω .047UF
+48V BKSP
A02N
PCC 2 N/C SECT 5A
A08E
TB32-1
F E
TB32-1
B C A
CARD LEVER
24-1
RELEASE
16-1
M-53°
B-3°
P6 COMM SECT 19A
OK HOLD SECT 19A
11B-3
680Ω .047UF
ERROR
26-2
ERROR LIGHT
B08K
B08L
32-5
470Ω
32-5G
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM DUP-CLEAR-REL-CD LEVER-SELF CHECK
DESIGN AG 15NOV66 MODEL
DETAIL
CHECK RAS 15NOV66 DRAW IDI 21NOV66
APPRO FGH 21NOV66 CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405921



NOTES

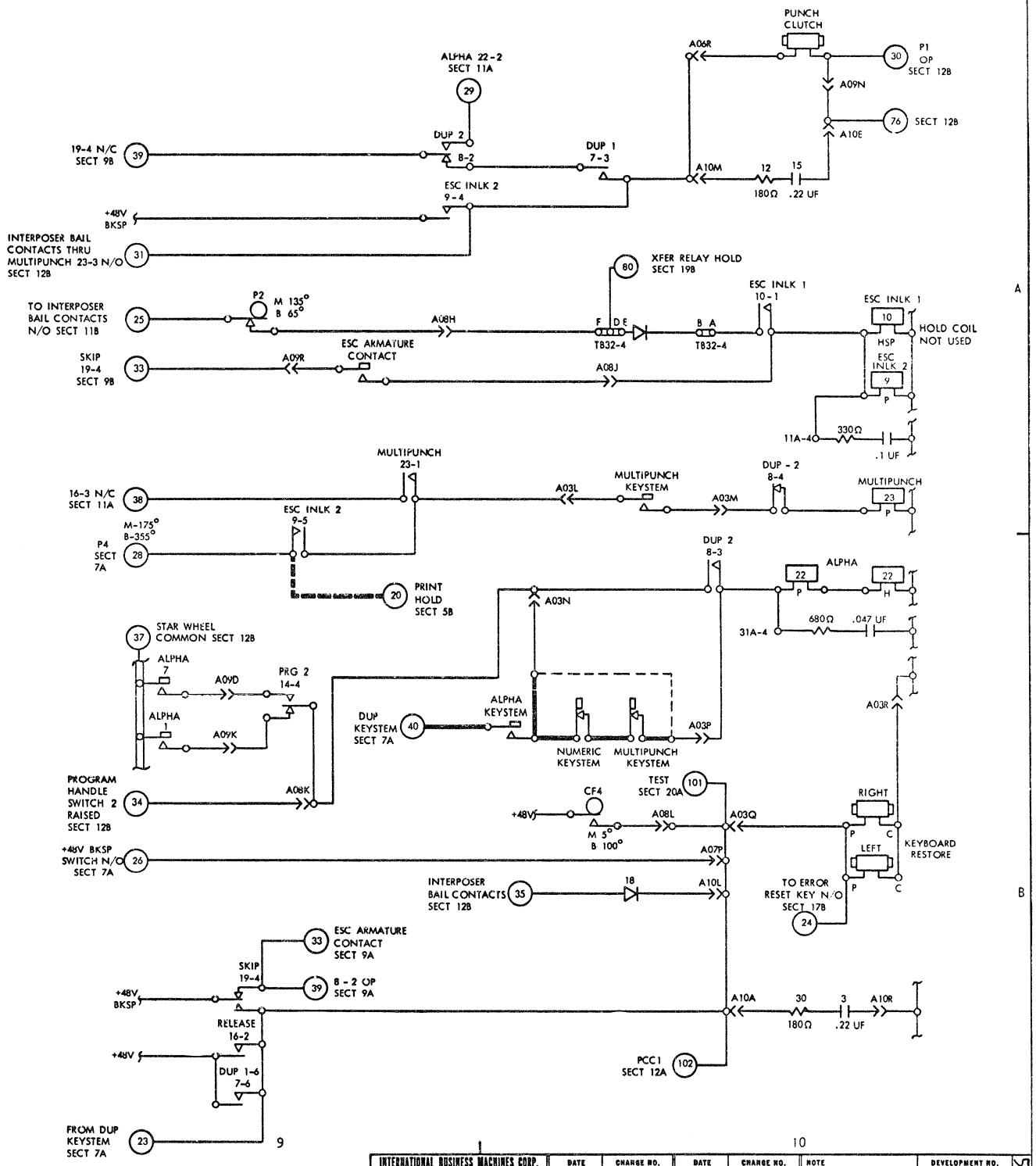
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM					14 OCT 66	205772-G			X PRINT TO ENG. SPEC. NO. 895291	
	DUP-CLEAR-REL-CD LEVER										
DESIGN	AG	9SEP66	MODEL								
DETAIL											
CHECK	RAS	9SEP66	DRAW	GT	7SEP66						
APPRO	FJH	9SEP66	CHECK								

5405974

9 MOD 10 AND 11 10 W/C

PUNCH CLUTCH-MULTIPCH-ALPHA-KEYBOARD RESTORE-SELF CHECK



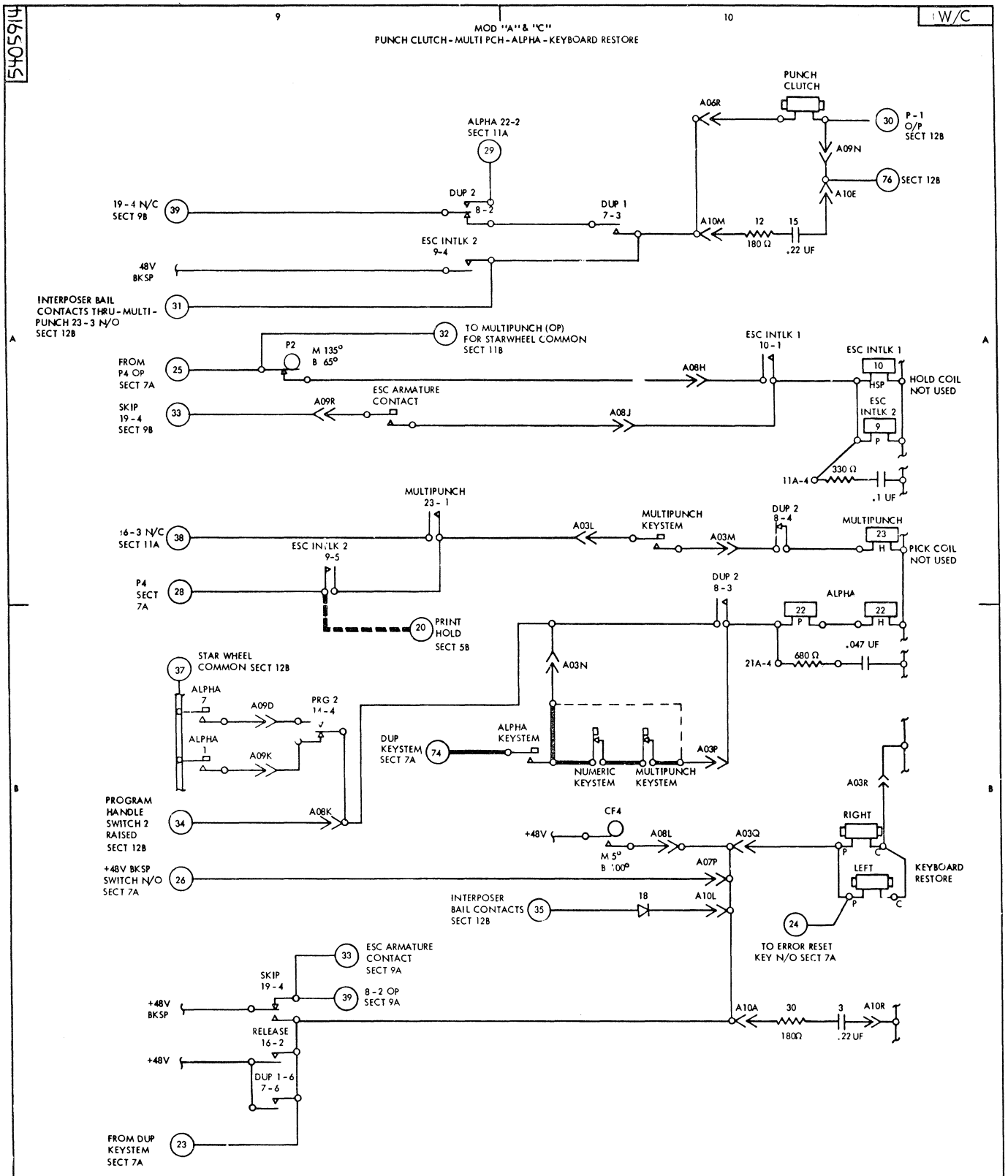
9 10

NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM-PCH-CLU-MULTIPCH-ALPHA-KB REST-SELF CHK					3 JAN 67	205773-G			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	15 NOV 66	MODEL								
DETAIL											
CHECK	RAS	15 NOV 66	DRAW	IDI	22 NOV 66						
APPRO	FGH	15 NOV 66	CHECK								

5405922

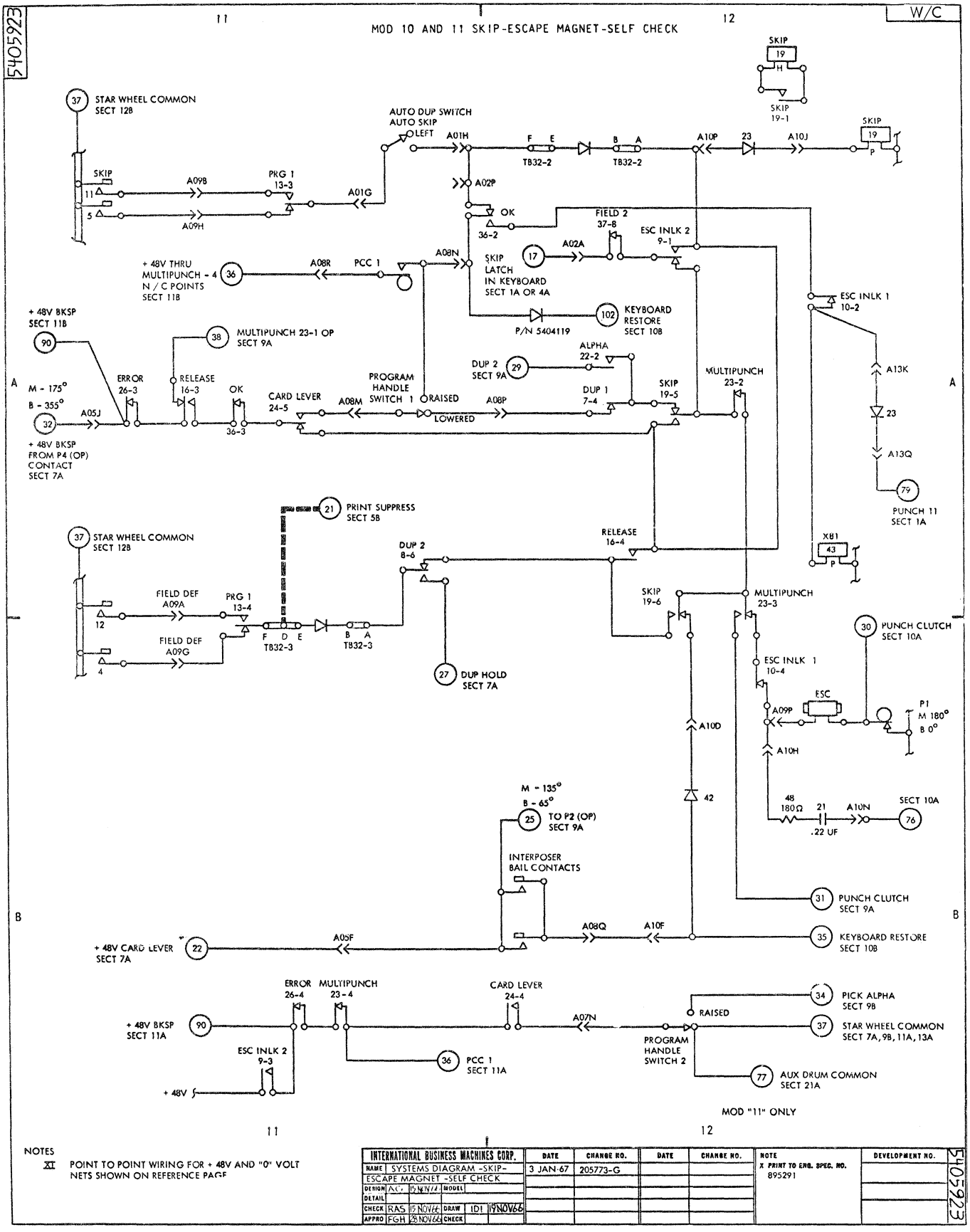


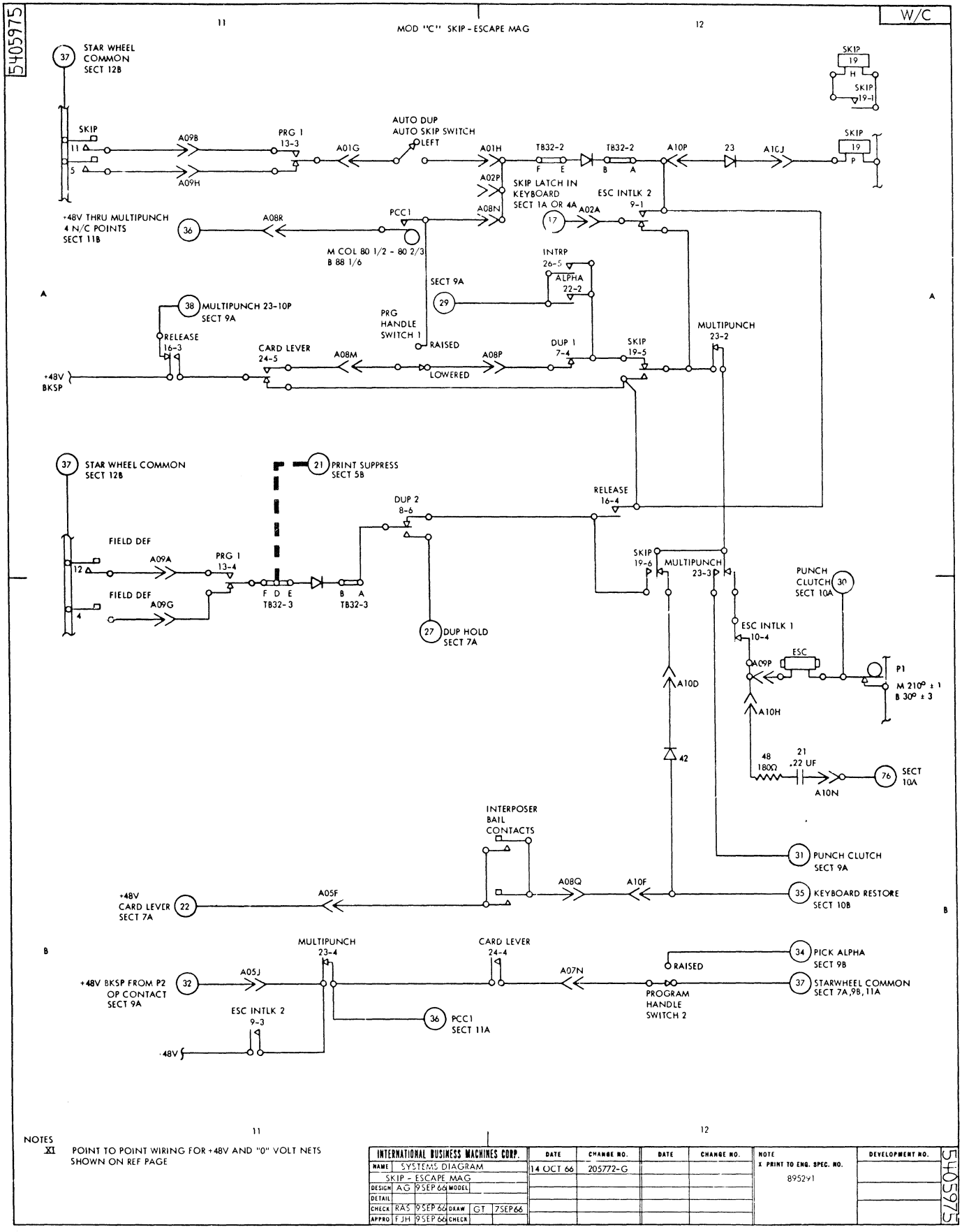
NOTES

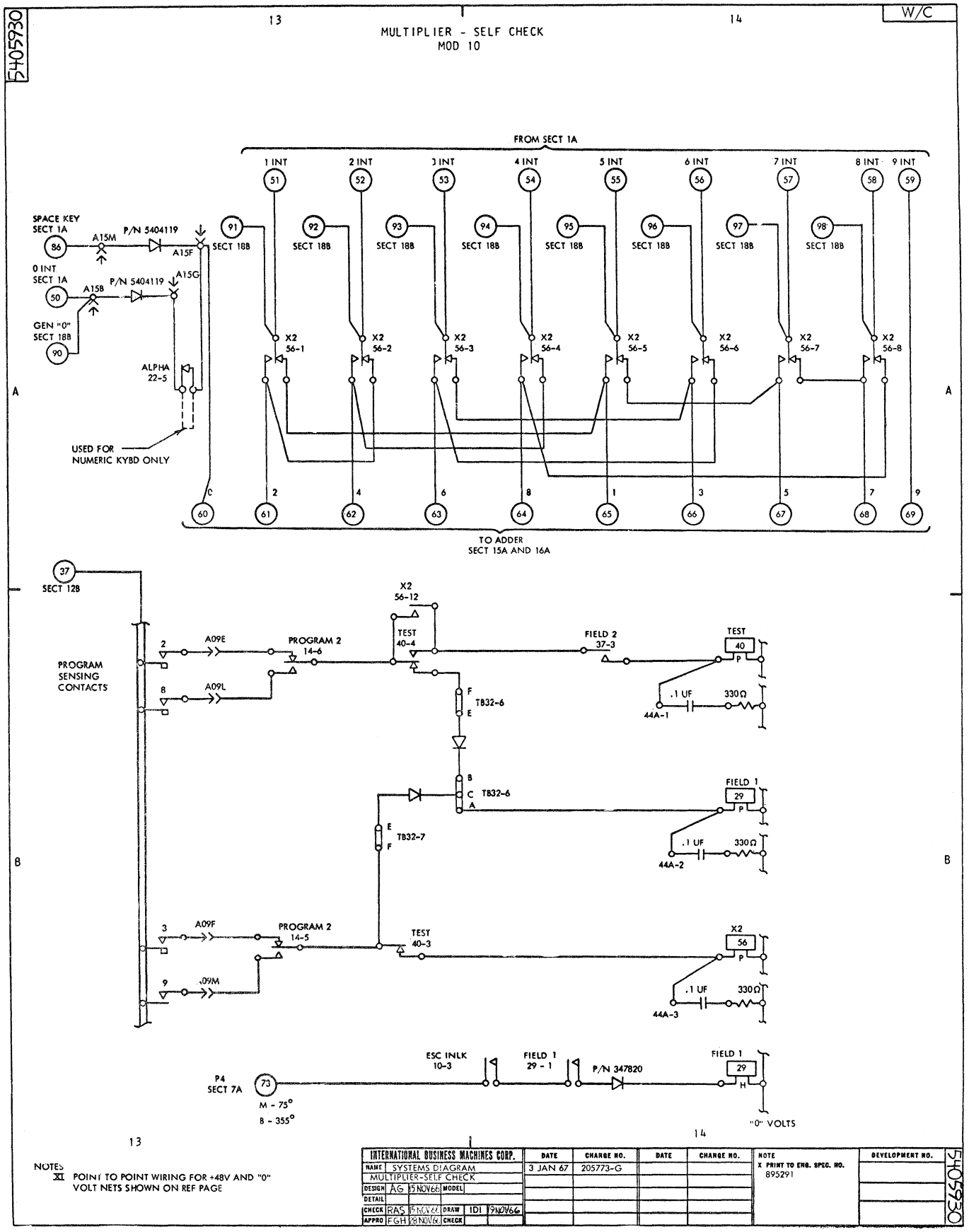
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

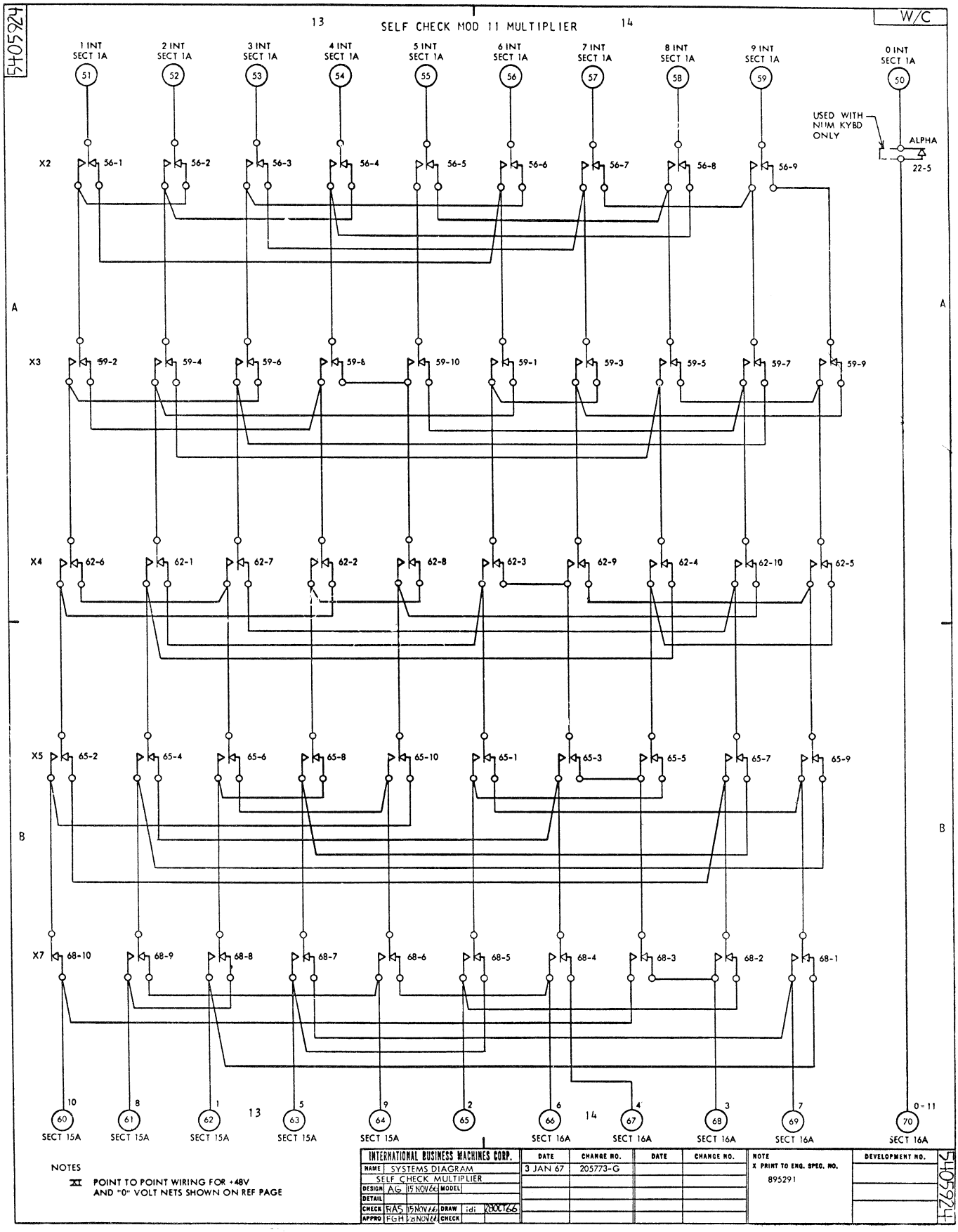
INTERNATIONAL BUSINESS MACHINES CORP.												
NAME	SYSTEM DIAGRAM						DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
	PCH CLUTCH-MP-ALPHA-KYBD RES						14 OCT 66	20[illegible]72-G			X PRINT TO ENG. SPEC. NO. 895291	
DESIGN	AG	9SEP66	MODEL									
DETAIL												
CHECK	RAS	9SEP66	DRAW	GT	7SEP66							
APPRO	FJH	9SEP66	CHECK									

5405914


5405923
W/C
MOD 10 AND 11 SKIP-ESCAPE MAGNET-SELF CHECK
11
12
37 STAR WHEEL COMMON SECT 12B
SKIP
AUTO DUP SWITCH AUTO SKIP
LEFT
A01H
TB32-2
A10P
23
A10J
SKIP 19 P
A09B
PRG 1 13-3
A01G
A09H
A02P
OK 36-2
FIELD 2 37-8
ESC INLK 2 9-1
A02A
17
+ 48V THRU MULTIPUNCH - 4 N/C POINTS SECT 11B
36
A08R
PCC 1
A08N
SKIP LATCH IN KEYBOARD SECT 1A OR 4A
102 KEYBOARD RESTORE SECT 10B
P/N 5404119
ESC INLK 1 10-2
+ 48V BKSP SECT 11B
90
38 MULTIPUNCH 23-1 OP SECT 9A
ALPHA 22-2
DUP 2 SECT 9A
29
MULTIPUNCH 23-2
A13K
23
A13Q
79 PUNCH 11 SECT 1A
M - 175°
B - 355°
ERROR 26-3
RELEASE 16-3
OK
CARD LEVER 24-5
A08M
PROGRAM HANDLE SWITCH 1
RAISED
LOWERED
A08P
DUP 1 7-4
SKIP 19-5
32
A05J
36-3
+ 48V BKSP FROM P4 (OP) CONTACT SECT 7A
21 PRINT SUPPRESS SECT 5B
37 STAR WHEEL COMMON SECT 12B
RELEASE 16-4
XB1 43 P
DUP 2 8-6
FIELD DEF A09A
PRG 1 13-4
12
FIELD DEF A09G
4
F D E TB32-3
B A TB32-3
SKIP 19-6
MULTIPUNCH 23-3
30 PUNCH CLUTCH SECT 10A
ESC INLK 1 10-4
ESC
A09P
P1 M 180° B 0°
A10D
A10H
27 DUP HOLD SECT 7A
M - 135°
B - 65°
25 TO P2 (OP) SECT 9A
42
48 180Ω
21 .22 UF
A10N
SECT 10A
76
INTERPOSER BAIL CONTACTS
31 PUNCH CLUTCH SECT 9A
A08Q
A10F
+ 48V CARD LEVER SECT 7A
22
A05F
35 KEYBOARD RESTORE SECT 10B
ERROR 26-4
MULTIPUNCH 23-4
CARD LEVER 24-4
34 PICK ALPHA SECT 9B
+ 48V BKSP SECT 11A
90
A07N
RAISED
37 STAR WHEEL COMMON SECT 7A, 9B, 11A, 13A
ESC INLK 2 9-3
36 PCC 1 SECT 11A
PROGRAM HANDLE SWITCH 2
77 AUX DRUM COMMON SECT 21A
+ 48V
MOD "11" ONLY
11
12
NOTES
XI POINT TO POINT WIRING FOR + 48V AND "0" VOLT NETS SHOWN ON REFERENCE PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM -SKIP-
ESCAPE MAGNET -SELF CHECK
DESIGN A.C. 15 NOV 66 MODEL
DETAIL
CHECK RAS 15 NOV 66 DRAW IDI 19NOV66
APPRO FGH 28 NOV 66 CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405923


5405975
W/C
MOD "C" SKIP - ESCAPE MAG
11
12
37 STAR WHEEL COMMON SECT 12B
SKIP 11
5
A09B
A09H
PRG 1 13-3
A01G
AUTO DUP
AUTO SKIP SWITCH
LEFT
A01H
TB32-2 F E
TB32-2 B A
A10P
23
A1CJ
SKIP 19 H
SKIP 19-1
SKIP 19 P
A02P
SKIP LATCH IN KEYBOARD SECT 1A OR 4A
ESC INTLK 2 9-1
A02A
17
+48V THRU MULTIPUNCH 4 N/C POINTS SECT 11B
36
A08R
PCC1
A08N
M COL 80 1/2 - 80 2/3
B 88 1/6
INTRP 26-5
ALPHA 22-2
SECT 9A
29
38 MULTIPUNCH 23-10P SECT 9A
RELEASE 16-3
PRG HANDLE SWITCH 1
RAISED
LOWERED
CARD LEVER 24-5
A08M
A08P
DUP 1 7-4
SKIP 19-5
MULTIPUNCH 23-2
+48V BKSP
37 STAR WHEEL COMMON SECT 12B
21 PRINT SUPPRESS SECT 5B
FIELD DEF
12
A09A
PRG 1 13-4
F D E TB32-3
B A TB32-3
FIELD DEF
A09G
4
DUP 2 8-6
27 DUP HOLD SECT 7A
RELEASE 16-4
SKIP 19-6
MULTIPUNCH 23-3
PUNCH CLUTCH SECT 10A
30
ESC INTLK 1 10-4
ESC
A09P
P1
M 210° ± 1
B 30° ± 3
A10D
A10H
42
48 180Ω
21 .22 UF
76 SECT 10A
A10N
INTERPOSER BAIL CONTACTS
31 PUNCH CLUTCH SECT 9A
+48V CARD LEVER SECT 7A
22
A05F
A08Q
A10F
35 KEYBOARD RESTORE SECT 10B
MULTIPUNCH 23-4
CARD LEVER 24-4
34 PICK ALPHA SECT 9B
RAISED
+48V BKSP FROM P2 OP CONTACT SECT 9A
32
A05J
A07N
PROGRAM HANDLE SWITCH 2
37 STARWHEEL COMMON SECT 7A,9B,11A
ESC INTLK 2 9-3
36 PCC1 SECT 11A
+48V
NOTES
X1 POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
SKIP - ESCAPE MAG
DESIGN AG 9SEP66 MODEL
DETAIL
CHECK RAS 9SEP66 DRAW GT 7SEP66
APPRO FJH 9SEP66 CHECK
DATE 14 OCT 66
CHANGE NO. 205772-G
NOTE X PRINT TO ENG. SPEC. NO. 8952V1
DEVELOPMENT NO.
5405975


5405930
W/C
MULTIPLIER - SELF CHECK
MOD 10
FROM SECT 1A
1 INT
2 INT
3 INT
4 INT
5 INT
6 INT
7 INT
8 INT
9 INT
SPACE KEY
SECT 1A
P/N 5404119
A15M
A15F
0 INT
SECT 1A
A15B
A15G
GEN "0"
SECT 18B
ALPHA
22-5
USED FOR
NUMERIC KYBD ONLY
SECT 18B
X2
56-1
X2
56-2
X2
56-3
X2
56-4
X2
56-5
X2
56-6
X2
56-7
X2
56-8
TO ADDER
SECT 15A AND 16A
SECT 12B
X2
56-12
PROGRAM
SENSING
CONTACTS
A09E
PROGRAM 2
14-6
TEST
40-4
FIELD 2
37-3
TEST
40
A09L
TB32-6
.1 UF
330Ω
44A-1
FIELD 1
29
TB32-7
44A-2
A09F
PROGRAM 2
14-5
TEST
40-3
X2
56
A09M
44A-3
ESC INLK
10-3
FIELD 1
29 - 1
P/N 347820
FIELD 1
29
P4
SECT 7A
M - 75°
B - 355°
"0" VOLTS
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
MULTIPLIER-SELF CHECK
DESIGN AG 15NOV66 MODEL
DETAIL
CHECK RAS 15NOV66 DRAW IDI 9NOV66
APPRO FGH 18NOV66 CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE
X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405930


SELF CHECK MOD 11 MULTIPLIER
W/C
1 INT SECT 1A
2 INT SECT 1A
3 INT SECT 1A
4 INT SECT 1A
5 INT SECT 1A
6 INT SECT 1A
7 INT SECT 1A
8 INT SECT 1A
9 INT SECT 1A
0 INT SECT 1A
USED WITH NUM KYBD ONLY
ALPHA
22-5
X2
X3
X4
X5
X7
SECT 15A
SECT 16A
NOTES
POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
SYSTEMS DIAGRAM
SELF CHECK MULTIPLIER
3 JAN 67
205773-G
X PRINT TO ENG. SPEC. NO.
895291

1405976

1 W/C

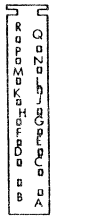
13

14

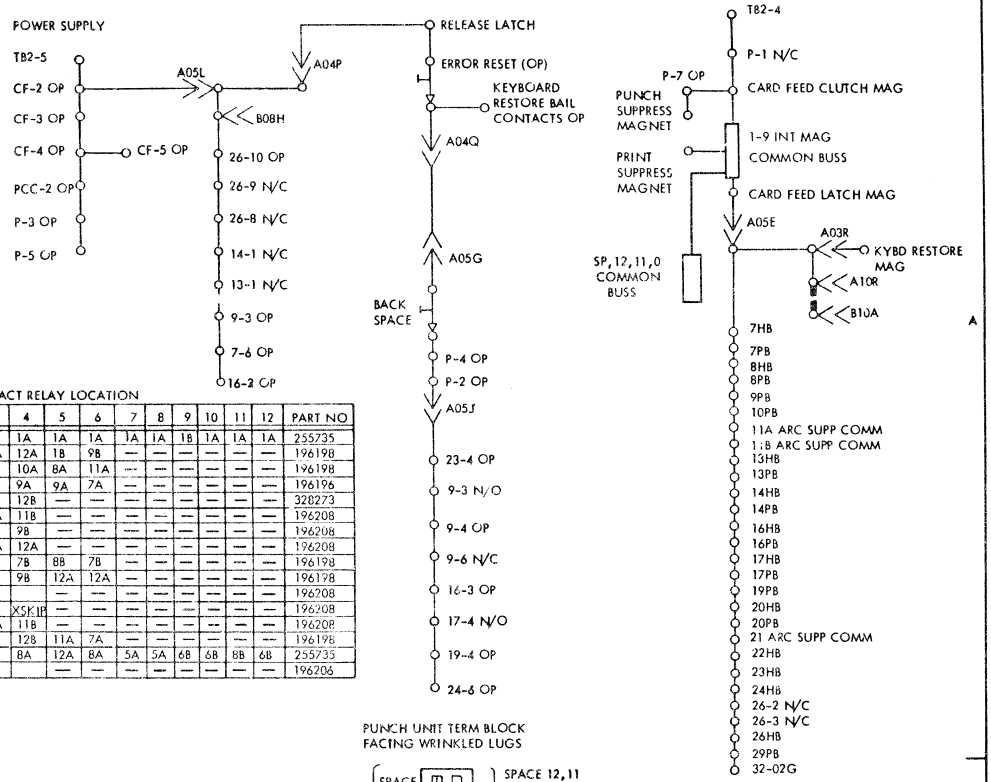
MOD "C" +48 VOLT NET

"0" VOLT NET

SMS SINGLE CARDS
POSITIONS A01 THRU A10 & B08 THRU B10



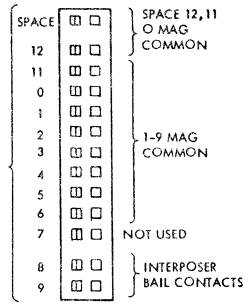
VIEW - TOP OF OPEN GATE (WIRING SIDE)



WIRE CONTACT RELAY LOCATION

RELAY	NO	P COIL H		1	2	3	4	5	6	7	8	9	10	11	12	PART NO
DUP 3	4	8B	8B	1A	1A	1A	1A	1A	1A	1A	1A	1B	1A	1A	1A	255735
DUP 1	7	8A	8A	7A	7B	10A	12A	1B	9B	—	—	—	—	—	—	196198
DUP 2	8	8B	8A	8A	9A	9B	10A	8A	11A	—	—	—	—	—	—	196198
ESC INTLK 2	9	10A	—	12A	8A	11B	9A	9A	7A	—	—	—	—	—	—	196196
ESC INTLK 1	10	10A		10A			12B	—	—	—	—	—	—	—	—	328273
PROGRAM 1	13	6A	6A	6A	6A	11A	11B	—	—	—	—	—	—	—	—	196208
PROGRAM 2	14	6A	6B	6B	6A	7A	9B	—	—	—	—	—	—	—	—	196208
RELEASE	16	8B	8B	8B	9B	11A	12A	—	—	—	—	—	—	—	—	196208
CLEAR	17	8B	8B	8B	5A	8B	7B	8B	7B	—	—	—	—	—	—	196198
SKIP	19	12A	12A	12A	8A	5B	9B	12A	12A	—	—	—	—	—	—	196198
PRINT	20	6B	6B	5B	5B			—	—	—	—	—	—	—	—	196208
ALPHA	22	10B	10B	1A	12A	4B	XSKIP	—	—	—	—	—	—	—	—	196208
MULTIPUNCH	23		10A	9A	12A	12A	11B	—	—	—	—	—	—	—	—	196208
CARD LEVER	24	8B	8B	6B	1A	6A	12B	11A	7A	—	—	—	—	—	—	196198
INTRP	26	8A	8A	8A	8B	8B	8A	12A	8A	5A	5A	6B	6B	8B	6B	255735
X-R ELIM	29	8A		1A	1A			—	—	—	—	—	—	—	—	196206

PUNCH UNIT TERM BLOCK
FACING WRINKLED LUGS



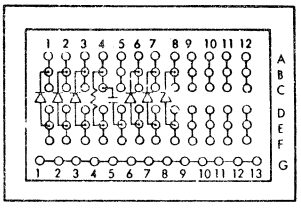
CONNECTOR CHART

SMS CARD CODE										FFJ				FFH
PIN	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10		B08	B09	B10
A	5A	12A	1A	1A	6B	2A	1B	5A	11A	10B			2A	6B
B	5A		1A	1A	1B	2A	1B	6A	11A				2A	5B
C	5A		1A	1A	1B	2A	1B	7B	7A	5A			6B	5B
D	5A	MC1	1A	1A	6A	2A	1B	5A	8B	12B			5B	5B
E	8A	AUX DUP	5A	1A	14A	2A	1B	7B		10A		7A	5A	5B
F	8A	4B	5A	1A	11B	2A	1B	7A		12B		7A	2B	5B
G	11A	5A	5A	1A	7A	2A	1B	7B	11B	5A		8A		6B
H	12A		5A	1A	6B	2A	1B	10A	11A	12B		8A		5B
J	7B		7A	1A	11B	2A	1B	10A	7A	12A				5B
K	7B		7A	1A	6B	2A	1B	9B	9B	7B				5B
L	6B		10A	1A	13A	2A	1B	9B		10B				5B
M	6B	XSKIP	10A	1A	VLCD	2A	1B	11A		10A		6B		5B
N	6B	8B	10B	1B	HSS	2B	12B	12A	10A	12B				
P	MC1	12A	10B	13A	HSS	7B	10B	12A	12B	12A				
Q		5A	10B	7A	MC1	8B	7B	12B	6B	7B				
R		8B	10B	4B	HSS	10A	7B	11A	9A	10B				

PUNCH CAMS

NO	LOC	PART NO	M	B
1	12B	309630	210° ± 1	30° ± 3
2	9A	309634	135° ± 3	65° ± 2
3	7B	350359	5° ± 1	65° ± 3
4	7A	309630	175° ± 3	355° ± 2
5	1B	309629	86° ± 3	156° ± 2
6	6B	309630	355° ± 3	175° ± 2
7	6B	313414	262° ± 3	60° ± 2

TERMINAL BLOCK 32



COMPONENT SIDE

COMP-P/N	DIODE-347820	DIODE-347820	DIODE-347820	RES-520404	CAP-540089D	DIODE-347820	DIODE-347820	DIODE-347820
PIN	1	2	3	4	5	6	7	8
A	8B	12A	11A			7A	8A	7A
B	8B	12A	11A	6B		7A	8A	7A
C	8B				6B			
D	8B		11A	5B				
E	8B	12A	11A	5B	6B	7A	8A	7A
F	8B	12A	11B	5B	6B	7A	8A	7A
C		14B			6B			

TB 32 LOCATION

ARC SUPPRESSION BLOCKS

PIN	11A	11B	21A
1	1A	6A	8B
2	1B	6B	8B
3	8A	8B	6B
4	10A	8B	10B

328602 328601 328601

CARD FEED CAMS

NO	LOCATION	PART NO	MAKE CONTACT	BREAK CONTACT
2	6A	344184	265° ± 5	65° ± 2
3	7B	315042	75° ± 2	285° ± 5
4	10B	313807	5° ± 2	100° ± 5
5	5B	311384	30° ± 2	45° ± 5

DISCRETE COMPONENTS

PART NO.	FROM	TO	SECTION
2160917	ACROSS CD FD MAG		6A
347820	19-3 N/C	20-2 OP	5B
347820	7-6 N/O	8-5 N/C	7A
347820	7 HA	8-1 OP	8A
347820	13 PA	13-2 N/O	6A
347820	13 HA	13-1 N/O	6A
347820	14 HA	14-1 N/O	6B
5347750	TB32-4F	26-12 N/O	6B
805044	TB32-5G	A05K	6B

20W & 10W RESISTORS MOUNTED ON RELAY GATE

LEGEND

PRINT FEATURE WIRING (STANDARD ON MOD "C")

COMBINATION KEYBOARD WIRING

NUMERIC KEYBOARD WIRING

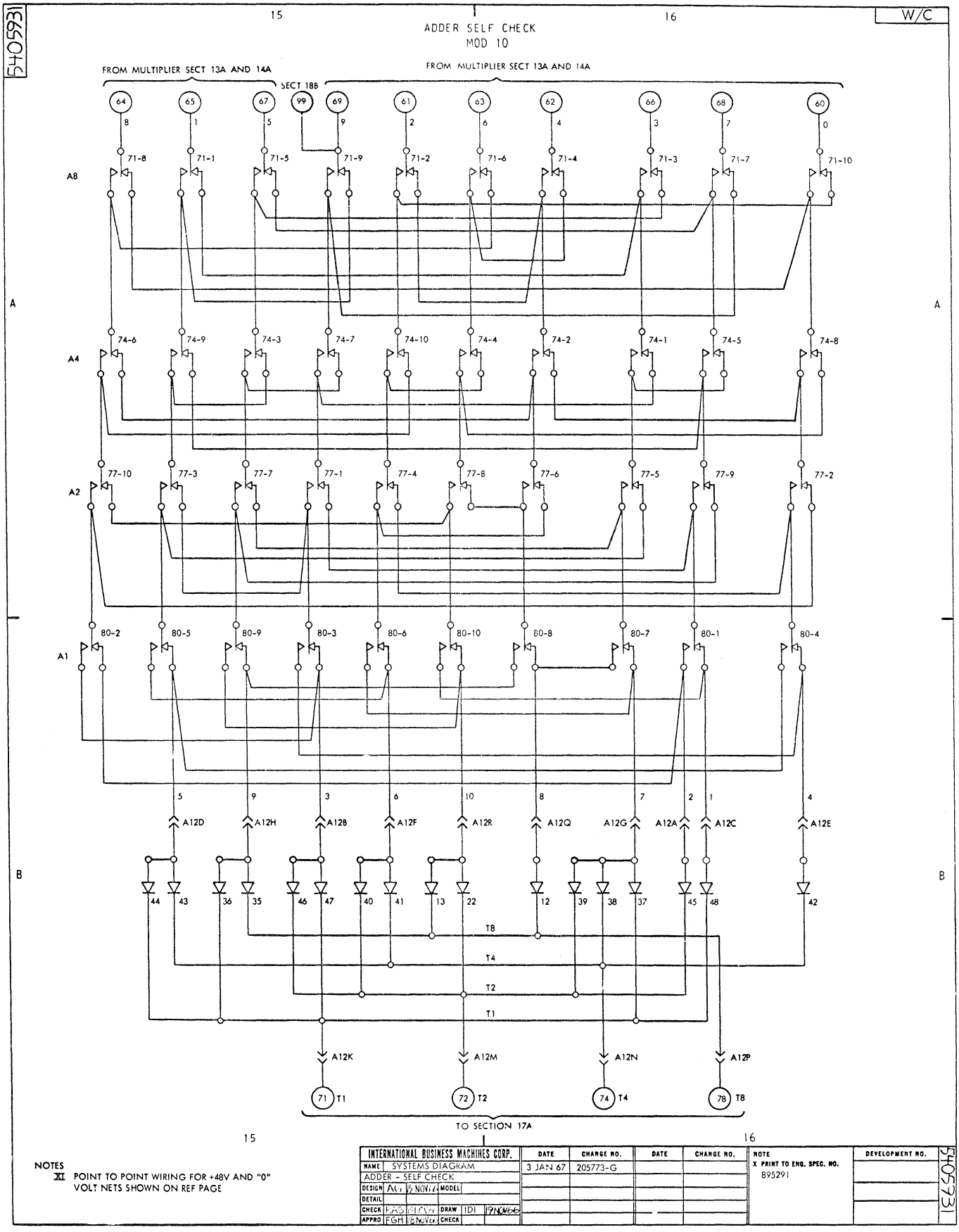
COMMON BUSS

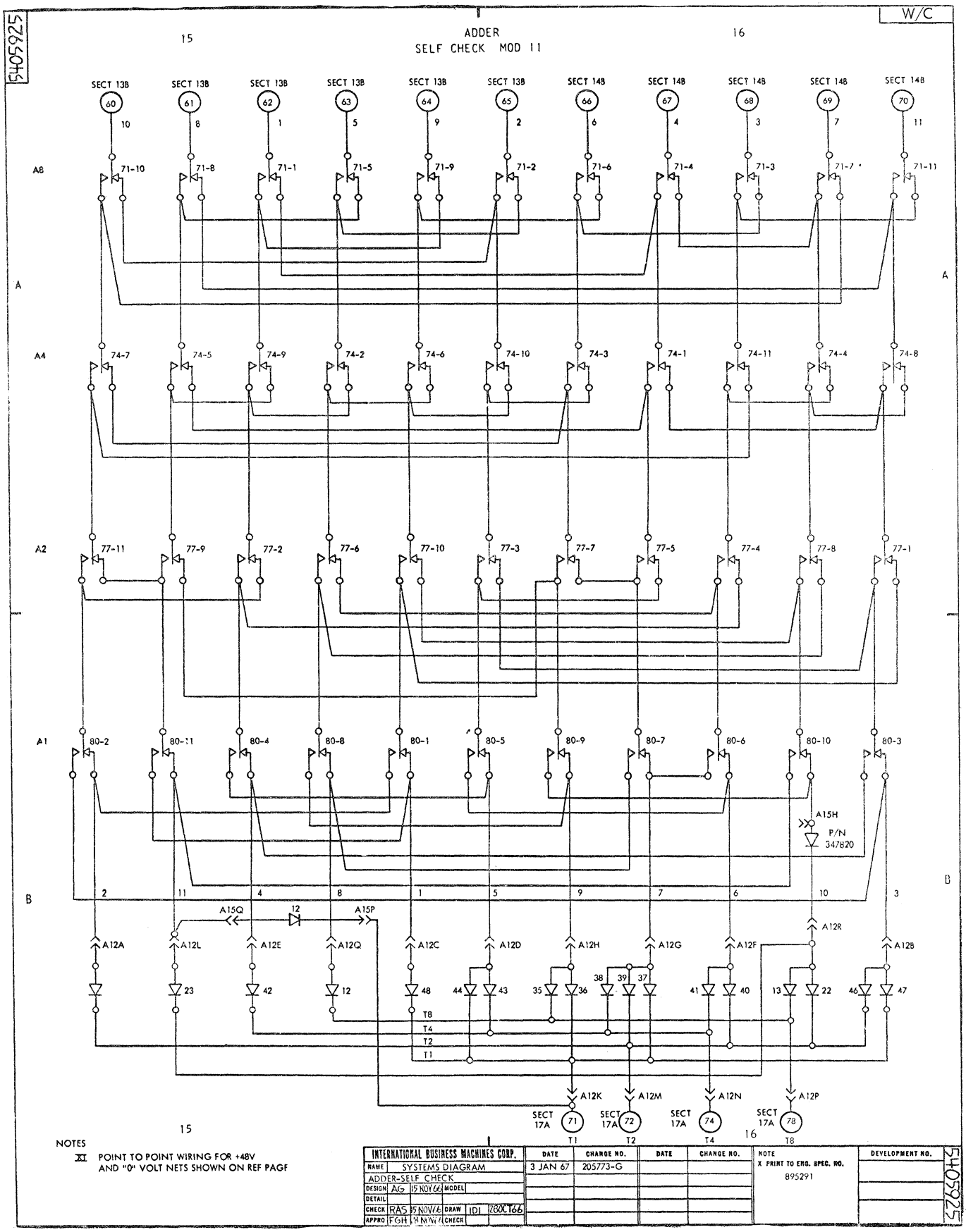
INTERNATIONAL BUSINESS MACHINES CORP.						DATE	CHANGE NO.	DATE	CHANGE NO.
NAME	SYSTEMS DIAGRAM CHART LOCATION					14 OCT 66	20°772-G		
DESIGN	AG	9SEP66	MODEL						
DETAIL									
CHECK	RAS	9SEP66	DRAW	GT	7SEP66				
APPRO	FJH	9SEP66	CHECK						

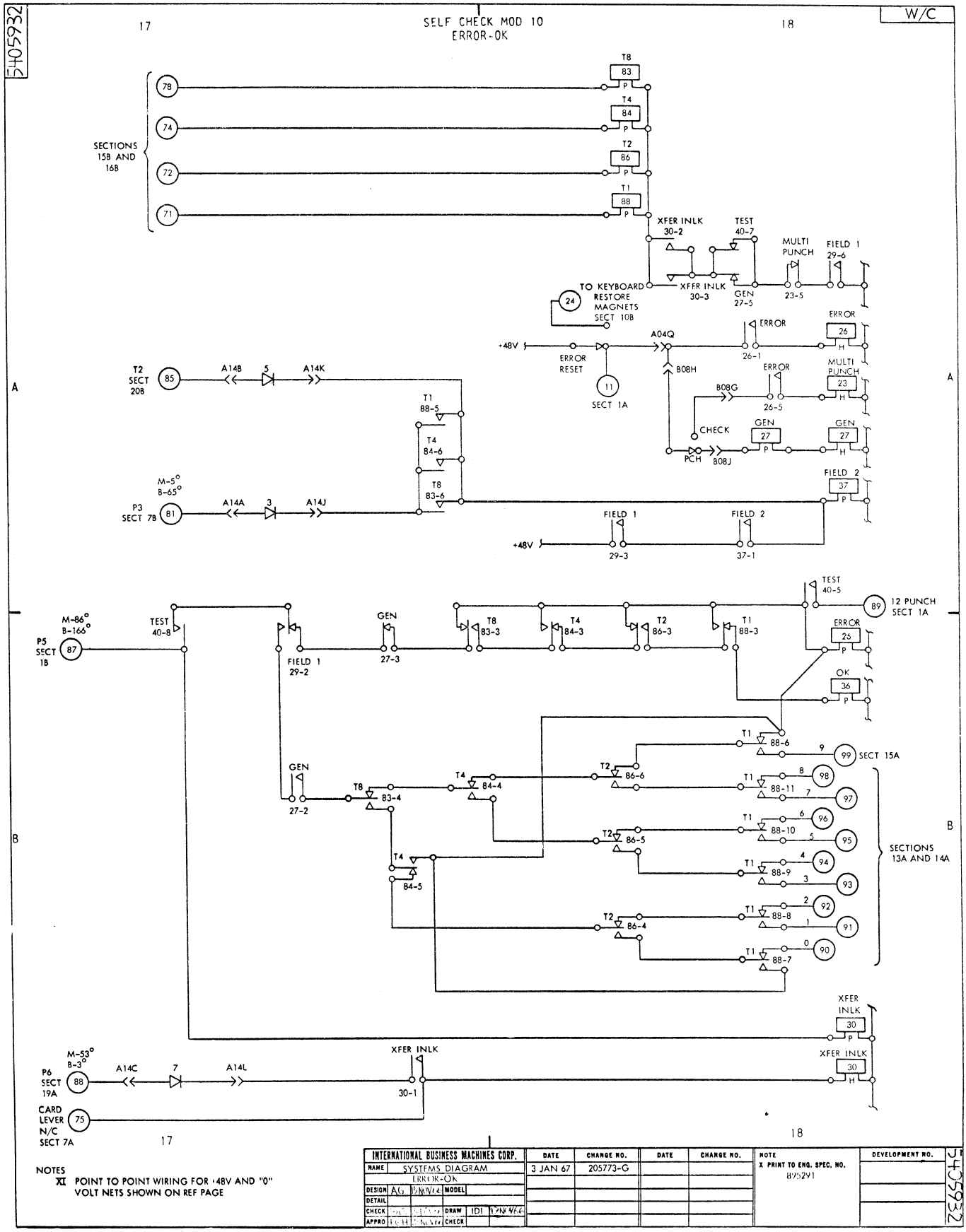
NOTE
X PRINT TO ENG. SPEC. NO.
895291

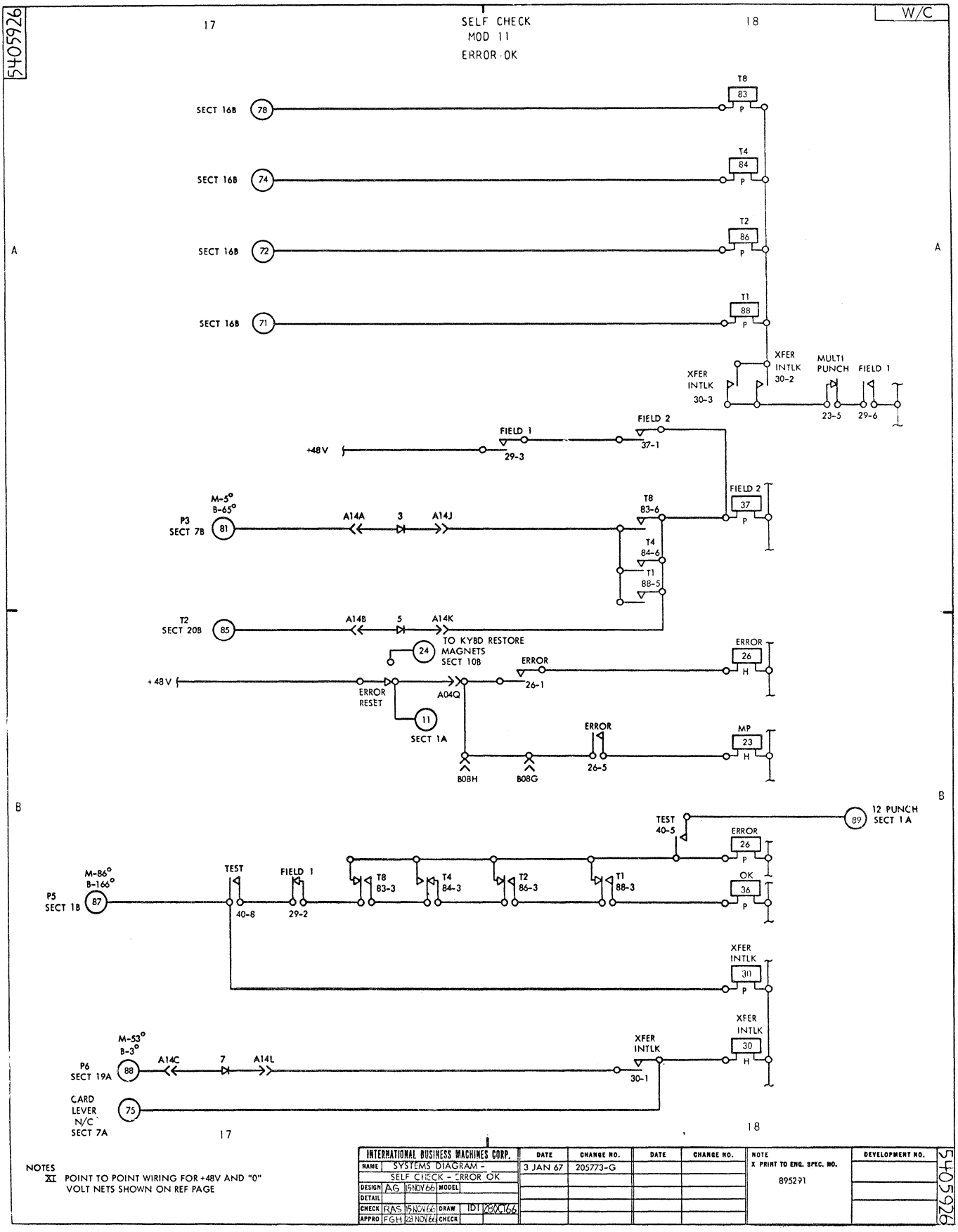
DEVELOPMENT NO.

1405976 0


5405931
15
16
W/C
ADDER SELF CHECK
MOD 10
FROM MULTIPLIER SECT 13A AND 14A
SECT 18B
FROM MULTIPLIER SECT 13A AND 14A
64 65 67 99 69 61 63 62 66 68 60
8 1 5 9 2 6 4 3 7 0
71-8 71-1 71-5 71-9 71-2 71-6 71-4 71-3 71-7 71-10
A8
A
74-6 74-9 74-3 74-7 74-10 74-4 74-2 74-1 74-5 74-8
A4
77-10 77-3 77-7 77-1 77-4 77-8 77-6 77-5 77-9 77-2
A2
80-2 80-5 80-9 80-3 80-6 80-10 80-8 80-7 80-1 80-4
A1
5 9 3 6 10 8 7 2 1 4
A12D A12H A12B A12F A12R A12Q A12G A12A A12C A12E
B
44 43 36 35 46 47 40 41 13 22 12 39 38 37 45 48 42
T8
T4
T2
T1
A12K A12M A12N A12P
71 T1 72 T2 74 T4 78 T8
TO SECTION 17A
15
16
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
ADDER - SELF CHECK
DESIGN AG MODEL
DETAIL
CHECK DRAW IDI
APPRO FGM CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405931


5405925
W/C
15
ADDER
SELF CHECK MOD 11
16
SECT 13B
SECT 14B
A8
A4
A2
A1
A15H
P/N 347820
A15Q
A15P
A12A
A12L
A12E
A12Q
A12C
A12D
A12H
A12G
A12F
A12R
A12B
A12K
A12M
A12N
A12P
T8
T4
T2
T1
SECT 17A
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
ADDER-SELF CHECK
DESIGN AG 15 NOV 66 MODEL
DETAIL
CHECK RAS 15 NOV 66 DRAW ID1 780CT66
APPRO FGH 16 NOV 66 CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ENG. SPEC. NO. 895291
DEVELOPMENT NO.
5405925

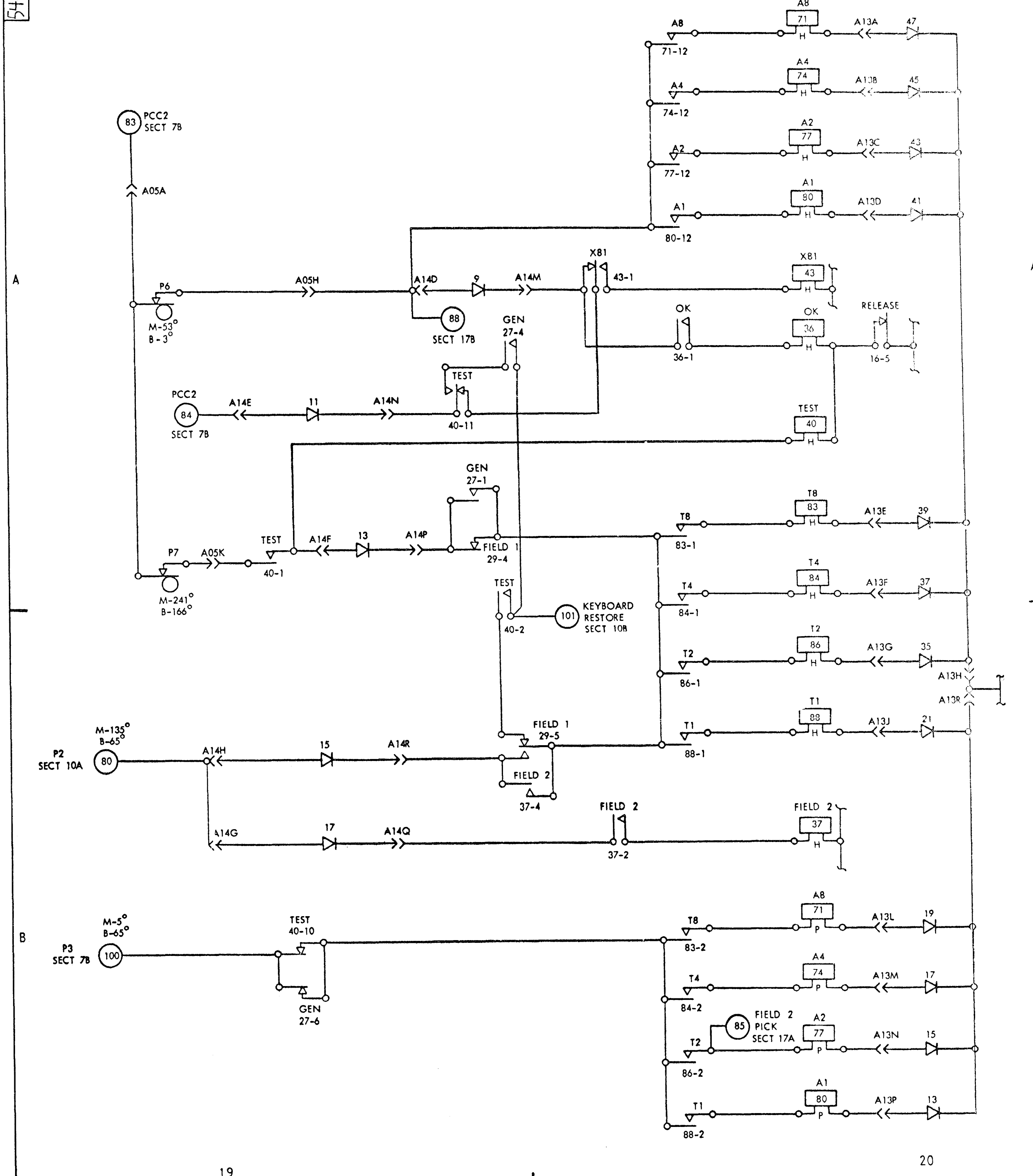

5405932
17
SELF CHECK MOD 10
ERROR-OK
18
W/C
T8 83 P
T4 84 P
T2 86 P
T1 88 P
78
74
72
71
SECTIONS 15B AND 16B
XFER INLK 30-2
TEST 40-7
MULTI PUNCH
FIELD 1 29-6
TO KEYBOARD RESTORE MAGNETS SECT 10B
24
XFER INLK 30-3
GEN 27-5
23-5
ERROR
26
A04Q
+48V
ERROR RESET
11
SECT 1A
26-1
B08H
ERROR
MULTI PUNCH 23 H
B08G
26-5
CHECK
GEN 27 P
GEN 27 H
PCH
B08J
T2 SECT 20B
85
A14B
5
A14K
T1 88-5
T4 84-6
T8 83-6
M-5° B-65°
P3 SECT 7B
81
A14A
3
A14J
FIELD 2 37 P
FIELD 1
FIELD 2
29-3
37-1
A
B
M-86° B-166°
P5 SECT 1B
87
TEST 40-8
FIELD 1 29-2
GEN 27-3
T8 83-3
T4 84-3
T2 86-3
T1 88-3
TEST 40-5
89
12 PUNCH SECT 1A
ERROR 26 P
OK 36 P
GEN 27-2
T8 83-4
T4 84-4
T4 84-5
T2 86-6
T2 86-5
T2 86-4
T1 88-6
T1 88-11
T1 88-10
T1 88-9
T1 88-8
T1 88-7
9
99
SECT 15A
8
98
7
97
6
96
5
95
4
94
3
93
2
92
1
91
0
90
SECTIONS 13A AND 14A
XFER INLK 30 P
XFER INLK 30 H
M-53° B-3°
P6 SECT 19A
88
A14C
7
A14L
XFER INLK 30-1
CARD LEVER N/C SECT 7A
75
17
18
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
ERROR-OK
DESIGN AG
DETAIL
CHECK
APPRO
MODEL
DRAW IDI
CHECK
DATE 3 JAN 67
CHANGE NO. 205773-G
NOTE X PRINT TO ENG. SPEC. NO. 892291
DEVELOPMENT NO.
5405932
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE


5405926
17
SELF CHECK
MOD 11
ERROR-OK
18
W/C
SECT 16B
78
74
72
71
T8
83
P
T4
84
T2
86
T1
88
XFER
INTLK
30-2
XFER
INTLK
30-3
MULTI
PUNCH
FIELD 1
23-5
29-6
FIELD 2
+48V
FIELD 1
29-3
37-1
M-5°
B-65°
P3
SECT 7B
81
A14A
3
A14J
T8
83-6
T4
84-6
T1
88-5
T2
SECT 20B
85
A14B
5
A14K
24
TO KYBD RESTORE
MAGNETS
SECT 10B
ERROR
26
H
+48V
ERROR
RESET
A04Q
26-1
11
SECT 1A
MP
23
B08H
B08G
26-5
12 PUNCH
SECT 1A
89
TEST
40-5
M-86°
B-166°
P5
SECT 1B
87
TEST
40-8
FIELD 1
29-2
T8
83-3
T4
84-3
T2
86-3
T1
88-3
OK
36
XFER
INTLK
31
M-53°
B-3°
P6
SECT 19A
88
A14C
7
A14L
XFER
INTLK
30-1
30
CARD
LEVER
N/C
SECT 7A
75
17
18
A
B
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM -
SELF CHECK - ERROR OK
DESIGN AG 15NOV66 MODEL
DETAIL
CHECK RAS 15NOV66 DRAW IDT 28DEC66
APPRO FGH 23 NOV 66 CHECK
DATE
CHANGE NO.
3 JAN 67
205773-G
NOTE
X PRINT TO ENG. SPEC. NO.
895291
DEVELOPMENT NO.
5405926

5405933

19 | SELF CHECK GEN MOD 10 TRANSFER AND ADD RELAYS | 20 | W/C

SELF CHECK GEN
MOD 10
TRANSFER AND ADD RELAYS

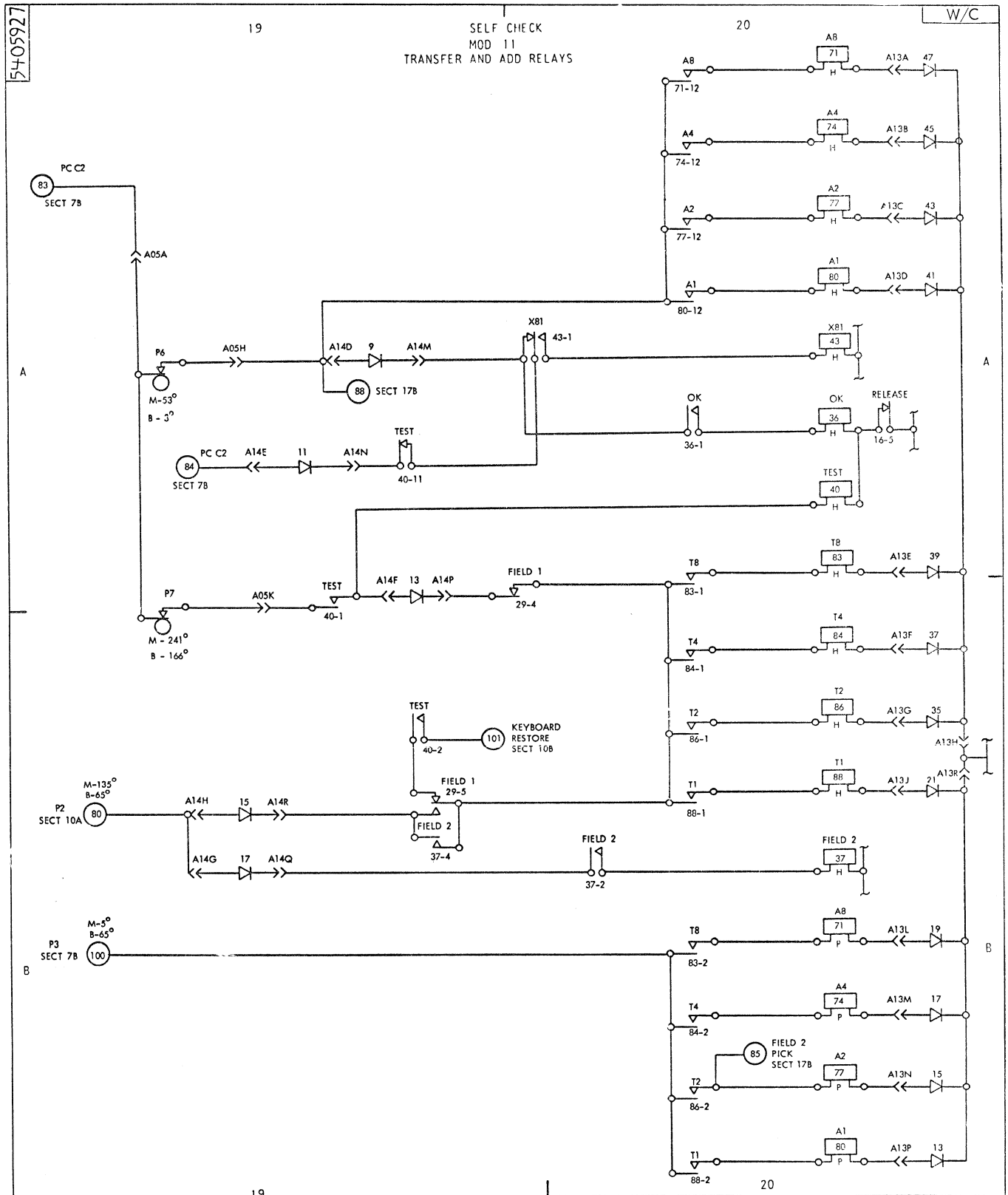


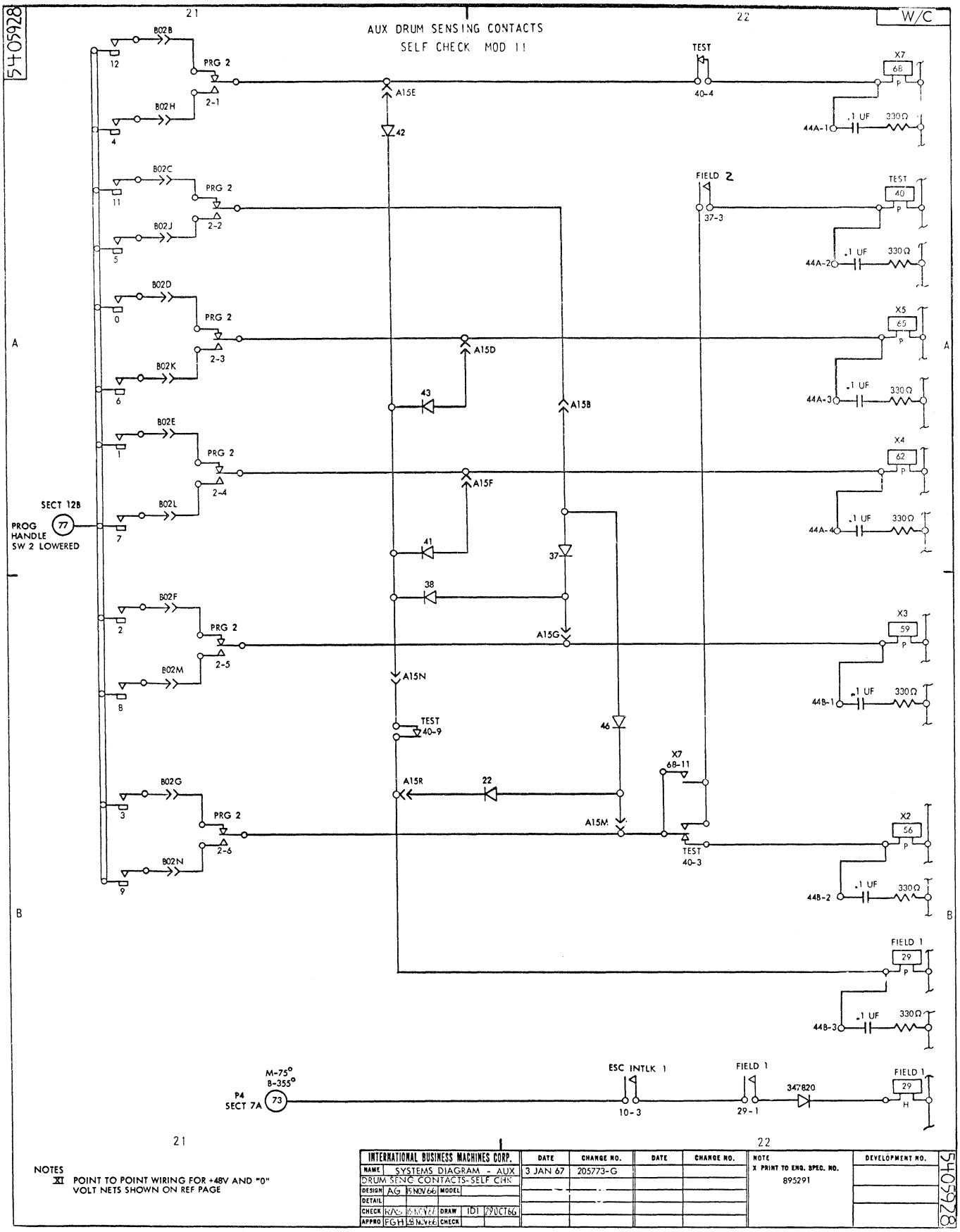
19 | 20

NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			3 JAN 67	205773-G			X PRINT TO ENG. SPEC. NO.	
	TRANSFER AND ADD RELAYS							895291	
DESIGN	AG	15NOV66	MODEL						
DETAIL									
CHECK	RAS	15NOV66	DRAW IDI 19NOV66						
APPRO	FGH	15NOV66	CHECK						

5405933


5405927
W/C
SELF CHECK
MOD 11
TRANSFER AND ADD RELAYS
19
20
PC C2
83
SECT 7B
A05A
P6
A05H
A14D
9
A14M
X81
43-1
88
SECT 17B
M-53°
B - 3°
OK
36-1
RELEASE
16-5
TEST
PC C2
84
SECT 7B
A14E
11
A14N
40-11
40-1
P7
A05K
A14F
13
A14P
FIELD 1
29-4
M - 241°
B - 166°
40-2
101
KEYBOARD
RESTORE
SECT 10B
FIELD 1
29-5
M-135°
B-65°
P2
SECT 10A
80
A14H
15
A14R
FIELD 2
37-4
A14G
17
A14Q
37-2
M-5°
B-65°
P3
SECT 7B
100
85
FIELD 2
PICK
SECT 17B
A8
A13A
47
A4
A13B
45
A2
A13C
43
A1
A13D
41
T8
A13E
39
T4
A13F
37
T2
A13G
35
A13H
T1
A13J
21
A13R
A13L
19
A13M
17
A13N
15
A13P
13
A
B
NOTES
XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE
INTERNATIONAL BUSINESS MACHINES CORP.
NAME SYSTEMS DIAGRAM
TRANSFER AND ADD RELAYS
DESIGN AG 15NOV66
DETAIL
CHECK RAS 15NOV66
APPRO FGH 29NOV66
DRAW IDI 31OCT66
CHECK
DATE
CHANGE NO.
3 JAN 67
205773-G
NOTE
X PRINT TO ENG. SPEC. NO.
895291
DEVELOPMENT NO.
5405927



NOTES

XI POINT TO POINT WIRING FOR +48V AND "0" VOLT NETS SHOWN ON REF PAGE

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM - AUX			3 JAN 67	205773-G			X PRINT TO ENG. SPEC. NO. 895291	
DRUM SENS CONTACTS-SELF CHK									
DESIGN	AG	15 NOV 66	MODEL						
DETAIL									
CHECK	[illegible]	[illegible]	DRAW	IDI	29 OCT 66				
APPRO	FGH	[illegible]	CHECK						

5405928

5405934

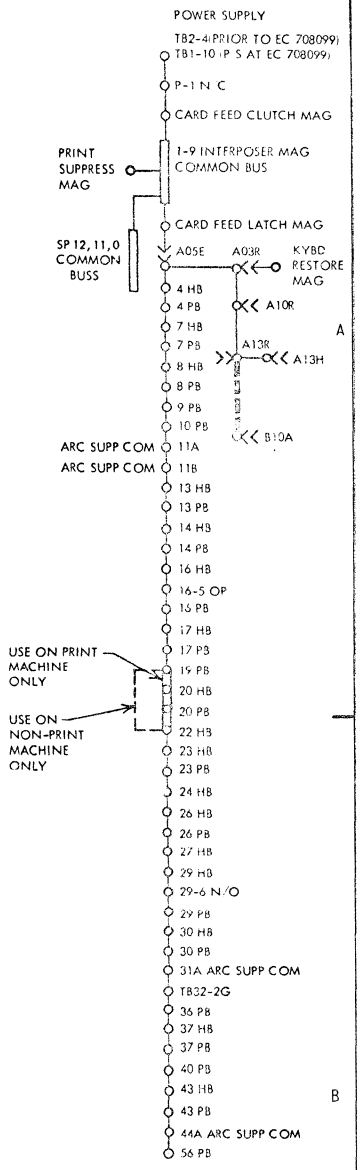
21 | 22 | W/C

COMPONENT LOCATION
MOD 10

SHEET 1 OF 2

WIRE CONTACT RELAY LOCATION

RELAY	NO.	COIL P	COIL H	1	2	3	4	5	6	7	8	9	10	11	12	PART NO.	COIL TYPE	
DUP 3	4	8B	8A	2A	2A	2A	2A	2A	2A	2A	2A	2B	2A	2A	2A	255735	PU	HRH
DUP 1	7	8A	8A	7A	7B	10A	12A	1B	9B	--	--	--	--	--	--	196193	HRH	
DUP 2	8	8B	8A	8A	9A	10B	10A	7A	11A	--	--	--	--	--	--	196198	HRH	
ESC INLK 2	9	10A	--	12A	8A	11B	9A	9A	7A	--	--	--	--	--	--	196198	PU	
ESC INLK 1	10	10A		10A	12A	14B	12B	--	--	--	--	--	--	--	--	104753	HSPU	HOLD
PROGRAM 1	13	6A	6A	6A	6A	11A	11B	6A	6A	--	--	--	--	--	--	196198	HRH	
PROGRAM 2	14	6A	6B	6B	6A	7A	9B	13B	13B	--	--	--	--	--	--	196198	HRH	
RELEASE	16	8B	8B	8B	9B	11A	12A	20A	7A	--	--	--	--	--	--	196198	HRH	
CLEAR	17	8B	8B	8B	5A	8B	7B	8B	7B	--	--	--	--	--	--	196198	HRH	
SKIP	19	12A	12A	12A	8A	5B	9B	12A	12A	--	--	--	--	--	--	196198	HRH	
PRINT	20	6B	6B	6B	6B			--	--	--	--	--	--	--	--	196208	PU	HRH
ALPHA	22	10B	10A	1A	12A	4B	X SKIP	13A		--	--	--	--	--	--	196198	HRH	
MULTIPUNCH	23	10A	18A	9A	12A	12B	11B	18A		--	--	--	--	--	--	196198	HRH	
CARD LEVER	24	8B	8B	8B	1A	6A	11B	11A	7A	--	--	--	--	--	--	196198	HRH	
ERROR	26	18B	18A	18A	8B	11A	11B	18A	7A	--	--	--	--	--	--	196198	HRH	
GEN	27	18A	18A	20B	17B	17B	19A	18A	19B	--	-	--	--	--	--	196198	HRH	
FIELD 1	29	14B	14B	14B	17B	18A	20B	18A	18A	--	--	--	--	--	--	196198	HRH	
XFER INLK	30	18B	18B	17B	18A	18A		--	--	--	--	--	--	--	--	196208	PU	HRH
OK	36	18B	20A	20A	12A	11A		--	--	--	--	--	--	--	--	196208	PU	HRH
FIELD 2	37	18A	20B	18A	20B	14B	19B	6A	6A	7A	12A					255735	PU	HRH
TEST	40	14B	20A	19B	19B	13B	13B	18B	8A	18A	17B		19B	19A		255735	PU	HRH
X-81	43	12A	20A	20A				--	--	--	--	--	--	--	--	196208	PU	HRH
X-2	56	14B	--	13A	13A	13A	14A	14A	14A	14A	14A				13B	196186	PU	
A8	71	20B	20A	15A	15A	16A	16A	15A	15A	16A	15A	15A	16A		20A	255735	PU	HRH
A4	74	20B	20A	16A	16A	15A	15A	16A	15A	15A	16A	15A	15A		20A	255735	PU	HRH
A2	77	20B	20A	15A	16A	15A	15A	16A	16A	15A	15A	16A	15A		20A	255735	PU	HRH
A1	80	20B	20A	16B	15B	15B	16B	15B	15B	16B	16B	15B	15B		20A	255735	PU	HRH
T8	83	18A	20A	20B	20B	18B	17B		17A	--	--	--	--	--	--	196198	HRH	
T4	84	18A	20B	20B	20B	18B	18B	17B	17A	--	--	--	--	--	--	196198	HRH	
T2	86	18A	20B	20B	20B	18B	18B	18B	18B	--	--	--	--	--	--	196198	HRH	
T1	88	18A	20B	20B	20B	18B		17A	18B	18B	18B	18B	18B	18B		255735	PU	HRH



SMS CARD NAME	CONNECTOR CHART									ARC SUPP		ENCODE	AM DIODE BLOCKING DIODES			PRINT
SMS CARD CODE										FFJ			BCV			
PIN	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	B08	B10
A	5A	12A	1A	1A	19A	2A	1B	6A	11A	10B		16B	20A	17A			22A
B	5A		1A	1A	1B	2A	1B	6A	11A			15B	20A	17A	13A		5B
C	5A		1A	1A	1B	2A	1B	7B	7A	5A		16B	20A	17B			5B
D	5A	MC1	1A	1A	6A	2A	1B	5A	9B	12B		15B	20A	19A			5B
E	7A	AUX DUP	5A	1A	22A	2A	1B	7B	13B	10A		16B	20A	19A			5B
F	7A	4B	5A	1A	11B	2A	1B	7A	13B	12B		15B	20B	19B	13A		5B
G	11A	5A	5A	1A	7A	2A	1B	7B	11A	5A		16B	20B	19B	13A	18A	6B
H	11A		5A	1A	19A	2A	1B	9A	11A	12B		15B	20B	19B		18A	6B
J	7B		7A	1A	11A	2A	1B	9A	7A	12A			20B	17A		18A	5B
K	7B		7A	1A	19B	2A	1B	8B	9B	8B		15B	12A	17A		8B	5B
L	6B		10A	1A	23A	2A	1B	8B	13B	10B		15B	20B	17B		8B	5B
M	6B	X SKIP	10A	1A	VLCD	2B	1B	11A	13B	10A		15B	20B	19A	13A		5B
N	6B	8B	9B	1A	HSS	2B	12B	11A	10A	12B		16B	20B	19A			
P	MC1	11A	9B	23A	HSS	7B	10B	11A	12A	12A		16B	20B	19B			
Q		5A	10B	18A	MC1	8B	8B	12B	6B	7B		16B	12A	19B			
R		8B	10B	4B	HSS	10A	7B	11A	10A	10B		15B	20B	19B			

TB32 LOCATION

COMP P/N	DIODE-347820	DIODE-347820	DIODE-347820	DIODE-347820	RES-5404302	DIODE-347820	DIODE-347820
PIN	1	2	3	4	5	6	7
A	7B	12A	11A	10A	8B	13B	
B	7B	12A	11A	10A	8B	13B	
C	7B					13B	
D			11A	10A			
E	7B	12A	11A	10A		13B	13B
F	7B	12A	11A	10A		13B	13B
G		22B			8B		

LEGEND
PRINT FEATURE WIRING
COMBINATION KEYBOARD WIRING
NUMERIC KEYBOARD WIRING
COMMON BUSS

INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			3 JAN 67	205773-G			X PRINT TO ENG. SPEC. NO. 895291	
	COMPONENT LOCATION								
DESIGN	AG	15NOV66	MODEL						
DETAIL									
CHECK	RAS	15NOV66	DRAW IDT	19NOV66					
APPRO	FGH	15NOV66	CHECK						

5405934

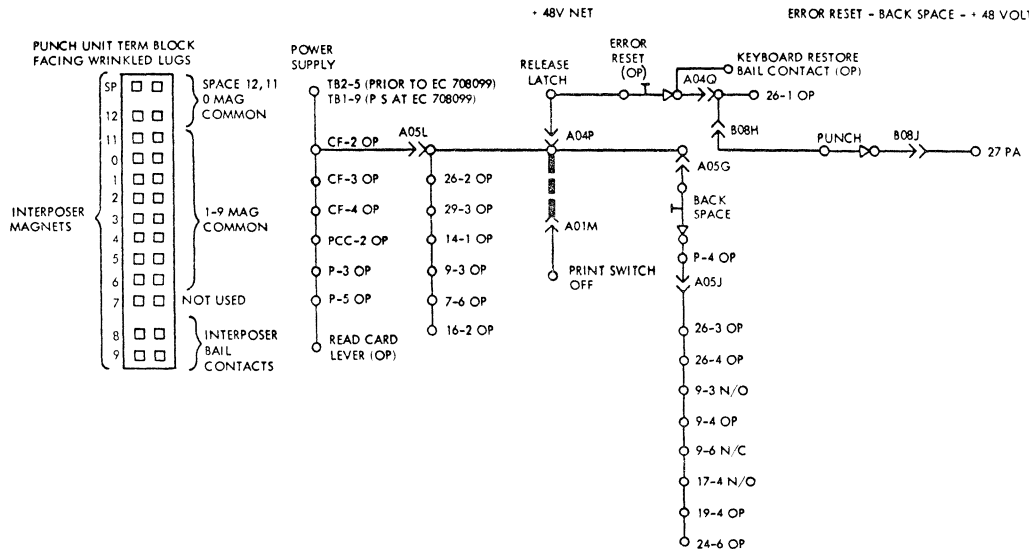
5405934

23 | 24

COMPONENT LOCATION
MOD 10

W/C

SHEET 2 OF 2



ARC SUPPRESSION BLOCKS

PART NO.	328602	328601	328601	328602
PIN	11A	11B	31A	44A
1	1A	6B	8B	14B
2	1B	6B	8B	14B
3	8A	8B	6B	14B
4	10A	8B	10B	

PUNCH CAMS

NO.	LOC	PART NO.	MAKE	BREAK
1	12A	309630	$180^\circ \pm 2^\circ$	$0^\circ \pm 3^\circ$
2	9A	309634	$135^\circ \pm 3^\circ$	$65^\circ \pm 2^\circ$
3	7B	350359	$5^\circ \pm 1^\circ$	$65^\circ \pm 3^\circ$
4	7A	309630	$75^\circ \pm 3^\circ$	$355^\circ \pm 2^\circ$
5	1B	309629	$86^\circ \pm 3^\circ$	$166^\circ \pm 2^\circ$
6	19A	310255	$53^\circ \pm 2^\circ$	$3^\circ \pm 3^\circ$
7	19B	309631	$241^\circ \pm 3^\circ$	$166^\circ \pm 2^\circ$

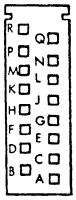
DISCRETE COMPONENTS

PART NO.	FROM	TO	SECT
2160917	ACROSS CD FD MAG		6A
5404119	A08N	A10A	12A
5404119	A15F	A15M	13A
5404119	A15B	A15G	13A
347820	19-3 N.C	20-2 OP	5B
347820	7-6 N/O	8-5 N.C	7A
347820	9-2 N.O	11A-3	8A
347820	29 HA	29-1 N.O	14B

CARD FEED CAMS

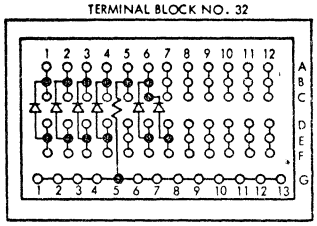
NO.	LOC.	PART NO.	MAKE CONTACT	BREAK CONTACT
2	6A	344184	$265^\circ \pm 5^\circ$	$65^\circ \pm 2^\circ$
3	7B	315042	$75^\circ \pm 2^\circ$	$285^\circ \pm 5^\circ$
4	9B	313807	$5^\circ \pm 2^\circ$	$100^\circ \pm 5^\circ$

SMS SINGLE CARDS
POSITIONS A01 THRU A15 AND
B02, B08, B10



VIEW - TOP OF OPEN GATE
(WIRING SIDE)

TERMINAL BLOCK NO. 32



COMPONENT SIDE

23 | 24

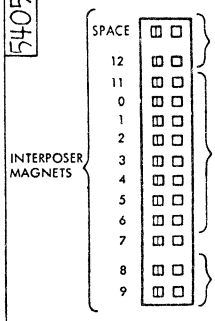
INTERNATIONAL BUSINESS MACHINES CORP.				DATE	CHANGE NO.	DATE	CHANGE NO.	NOTE	DEVELOPMENT NO.
NAME	SYSTEMS DIAGRAM			3 JAN 67	205773-G			X PRINT TO ENG. SPEC. NO. 895291	
	COMPONENT LOCATION								
DESIGN	AG	15NOV66	MODEL						
DETAIL									
CHECK	RAS	15NOV66	DRAW	IDI	14NOV66				
APPRO	FGH	15 NOV66	CHECK						

5405934

5405929

W/C

PUNCH UNIT TERM BLOCK FACING WRINKLED LUGS

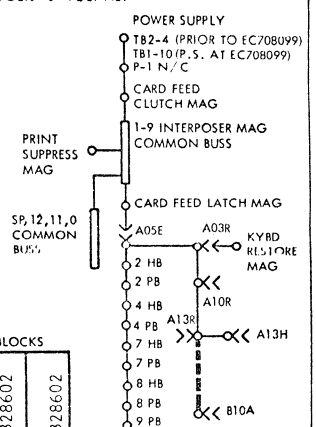


23

COMPONENT LOCATION | MOD 11

24

ERROR RESET - BACK SPACE - + 48 VOLTS "0" VOLT NET



WIRE CONTACT RELAY LOCATION

RELAY	NO.	COIL P	COIL H	1	2	3	4	5	6	7	8	9	10	11	12	PART NO. NOTE XI
PROGRAM 2	2	6A	6B	21A	21A	21A	21A	21b	21B	-	-	-	-	-	-	196198
DUP 3	4	8B	8A	2A	2A	2A	2A	2A	2A	2A	2A	2B	2A	2A	2A	255735
DUP 1	7	8A	8A	7A	7B	10A	12A	1B	9B	-	-	-	-	-	-	196198
DUP 2	8	8B	8A	8A	9A	10B	10A	7A	11A	-	-	-	-	-	-	196198
ESC INTLK 2	9	10A	-	12A	8A	11B	9A	9A	7A	-	-	-	-	-	-	196196
ESC INTLK 1	10	10A		10A	12A	22B	12B	-	-	-	-	-	-	-	-	104753
PROGRAM 1	13	6A	6A	6A	6A	11A	11B	6A	6A	-	-	-	-	-	-	196198
PROGRAM 2	14	6A	6B	6B	6A	7A	9B	-	-	-	-	-	-	-	-	196208
RELEASE	16	8B	8B	8B	9B	11A	12A	20A	7A	-	-	-	-	-	-	196198
CLEAR	17	8B	8B	8B	5A	8B	7B	8B	7B	-	-	-	-	-	-	196198
SKIP	19	12A	12A	12A	8A	5B	9B	12A	12A	-	-	-	-	-	-	196198
PRINT	20	6B	6B	6B	6B			-	-	-	-	-	-	-	-	196208
ALPHA	22	10B	10B	1A	12A	4B	X SKIP	14A		-	-	-	-	-	-	196198
MULTIPUNCH	23	10A	18B	9A	12A	12B	11B	18A		-	-	-	-	-	-	196198
CARD LEVER	24	8B	8B	8B	1A	6A	11B	11A	7A	-	-	-	-	-	-	196198
ERROR	26	18B	18B	18B	8B	11A	11B	18B	7A	-	-	-	-	-	-	196198
FIELD 1	29	22B	22B	22B	17A	10A	20B	20B	18A	-	-	-	-	-	-	196198
XFER INTLK	30	18B	18B	18B	18A	18A		-	-	-	-	-	-	-	-	196208
OK	36	18B	20A	20A	12A	11A		-	-	-	-	-	-	-	-	196208
FIELD 2	37	18A	20B	18A	20B	22A	19B	6A	6A	7A	12A					255735
TEST	40	22A	20A	19B	19B	22B	22A	18B	8A	GEN	17B	21B	GEN	19A		255735
X-81	43	12A	20A	20A				-	-	-	-	-	-	-	-	196208
X-2	56	22B	-	13A	13A	13A	13A	13A	14A	14A	14A	14A				196186
X-3	59	22B	-	14A	13A	14A	13A	14A	13A	14A	13A	14A	13A			196186
X-4	62	22A	-	13A	13A	14A	14A	14A	13A	13A	13A	14A	14A			196186
X-5	65	22A	-	14B	13B	14B	13B	14B	13B	14B	13B	13B	13B			196186
X-7	68	22A	-	14B	14B	14B	14B	14B	13B	13B	13B	13B	13B			196186
A8	71	20B	20A	15A	16A	16A	16A	15A	16A	16A	15A	15A	15A	16A	20A	255735
A4	74	20B	20A	16A	15A	16A	16A	15A	15A	15A	16A	15A	16A	16A	20A	255735
A2	77	20B	20A	16B	15B	16B	16B	16B	15B	16B	16B	15B	15B	15B	20A	255735
A1	80	20B	20A	15B	15B	16B	15B	16B	16B	16B	15B	16B	16B	15B	20A	255735
T8	83	18A	20A	20A	20B	17B	GEN		18B	-	-	-	-	-	-	196198
T4	84	18A	20B	20B	20B	17B	GEN	GEN	18B	-	-	-	-	-	-	196198
T2	86	18A	20B	20B	20B	18B	GEN	GEN	GEN	-	-	-	-	-	-	196198
T1	88	18A	20B	20B	20B	10B		18B		GEN	GEN	GEN	GEN	GEN		255735

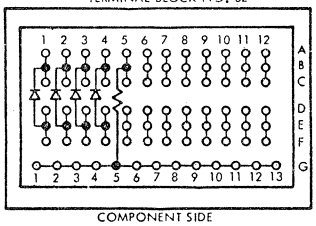
ARC SUPPRESSION BLOCKS

PART NO.	328602	328601	328601	328602	328602
PIN	11A	11B	31A	44A	44B
1	1A	6B	8B	22A	22B
2	1B	6B	8B	22A	22B
3	8A	8B	6B	22A	22B
4	10A	8B	10B	22A	

TB32 LOCATION

COMP P/N	DIODE - 347820	DIODE - 347820	DIODE - 347820	DIODE - 347820	RES - 5404302
PIN	1	2	3	4	5
A	7B	12A	11A	10A	8B
B	7B	12A	11A	10A	8B
C	7B				
D			11A	10A	
E	7B	12A	11A	10A	
F	7B	12A	11A	10A	
G		24B			8B

TERMINAL BLOCK NO. 32



COMPONENT SIDE

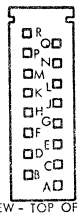
SMS CARD NAME	CONNECTOR CHART								ARC SUPP		DIODE	AM MODE	SLOW SPEED MODE	STEP SPEED MODE		PRINT
SMS CARD CODE									FFJ		FKG	BCV	FKJ	FKH		FFH
PIN	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	B02	B08	B10
A	5A	12A	1A	1A	19A	2A	1B	6A	11A	10B		15B	20A	17B				24A
B	5A		1A	1A	1B	2A	1B	6A	11A			16B	20A	17B	22B	21A		5B
C	5A		1A	1A	1B	2A	1B	7B	7A	5A		15B	20A	17B		21A		5B
D	5A	MCI	1A	1A	6A	2A	1B	5A	9B	12B		16B	20A	19A	21A	21A		5B
E	7A	AUX DUP	5A	1A	24A	2A	1B	7B		10A		15B	20A	19A	21A	21A		5B
F	7A	4B	5A	1A	11B	2A	1B	7A		12B		16B	20B	19B	21A	21B		5B
G	11A	5A	5A	1A	7A	2A	1B	7B	11A	5A		16B	20B	19B	22B	21B	17B	6B
H	11A		5A	1A	19A	2A	1B	9A	11A	12B		16B	20B	19B	16B	21A	17B	6B
J	7B		7A	1A	11A	2A	1B	9A	7A	12A			20B	17B		21A		5B
K	7B		7A	1A	19B	2A	1B	8B	9B	8B		16B	12A	17B		21A	8B	5B
L	6B		10A	1A	23A	2A	13	8B		10B		15B	20B	17B		21A	8B	5B
M	6B	X SKIP	10A	1A	VLCD	2B	1B	11A		10A		16B	20B	19A	22B	21B		5B
N	6B	8B	9B	1A	HSS	2B	12B	11A	10A	12B		16B	20B	19A	21B	21B		
P	MCI	11A	9B	23A	HSS	7B	10B	11A	12A	12A		16B	20B	19B	15B			
Q		5A	10B	24A	MCI	8B	8B	12B	6B	7B		15B	12A	19B	15B			
R		8B	10B	4B	HSS	10A	7B	11A	10A	10B		16B	20B	19B	21B			

PUNCH CAMS

NO.	LOC	PART NO.	M	B
1	12A	309630	180° ± 2°	0° ± 3°
2	9A	309634	135° ± 3°	65° ± 2°
3	7B	350359	5° ± 1°	65° ± 3°
4	7A	309630	75° ± 3°	355° ± 2°
5	1B	309629	86° ± 3°	166° ± 2°
6	19A	310255	53° ± 2°	3° ± 3°
7	19B	309631	241° ± 3°	166° ± 2°

DISCRETE COMPONENTS

PART NO.	FROM	TO	SECTION
2160917	ACROSS CD FD MAG		6A
347820	19-3 N/C	20-2 OP	5B
347820	7-6 N/O	8-5 N/C	7A
347820	9-2 N/O	11A-3	8A
5404119	A08N	A10A	11A
347820	A15H	A12R	16B
347820	29HA	29-1 N/O	22B



SMS SINGLE CARDS POSITIONS A01 THRU A15 AND B02, B08, B10

VIEW - TOP OF OPEN GATE (WIRING SIDE)

23

CARD FEED CAMS

NO.	LOCATION	PART NO.	MAKE CONTACT	BREAK CONTACT
2	6A	344184	265° ± 5°	65° ± 2°
3	7B	315042	75° ± 2°	285° ± 5°
4	9B	313807	5° ± 2°	100° ± 5°

24

LEGEND

- PRINT FEATURE WIRING
- COMBINATION KEYBOARD WIRING
- NUMERIC KEYBOARD WIRING
- COMMON BUSS

NOTES

XI RELAY COIL TYPES: P/N 196198-HRH, P/N 196196, 196186-PU, P/N 255735, 196208-PU-HRH, P/N 104753-HSPU-HOLD

INTERNATIONAL BUSINESS MACHINES CORP.					
NAME	SYSTEMS DIAGRAM				
COMPONENT LOCATION MOD 11					
DESIGN	AG	15NV66	MODEL		
DETAIL					
CHECK	DAS	15NV66	DRAW	IDT	18OCT66
APPRO	FGH	18NV66	CHECK		

DATE	CHANGE NO.	DATE	CHANGE NO.
3 JAN 67	205773-G		

NOTE
X PRINT TO ENG. SPEC. NO. 895291

DEVELOPMENT NO.

5405929

Index

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